United States
Department of
Agriculture

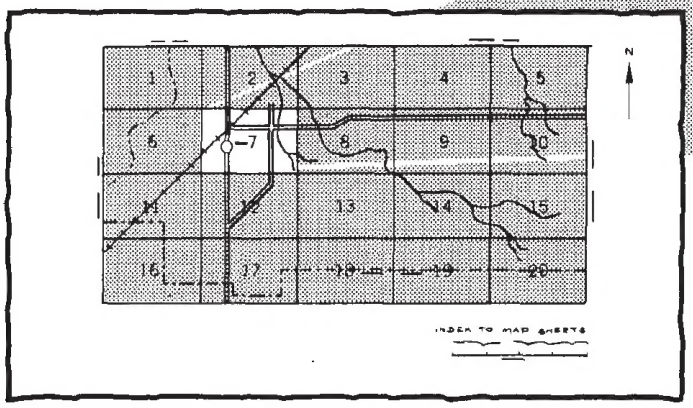
Soil
Conservation
Service

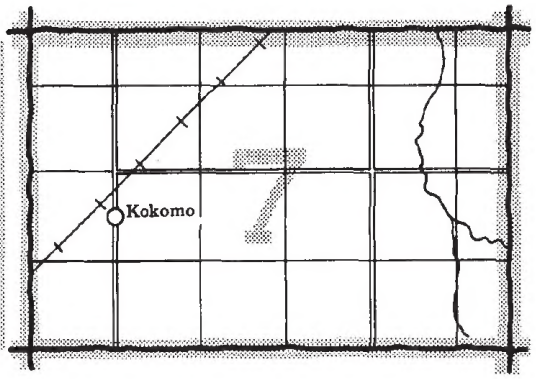
In cooperation with
Virginia Polytechnic Institute
and
State University

Soil Survey of Clarke County Virginia

HOW TO USE

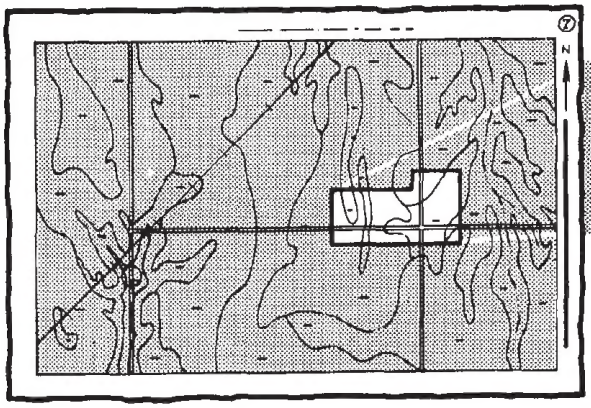
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

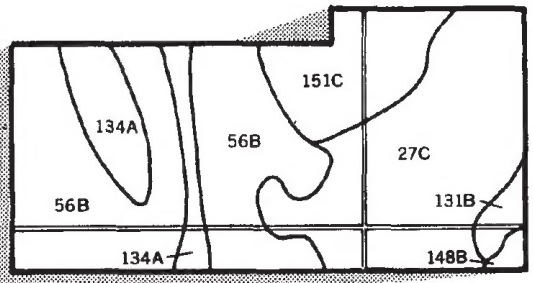




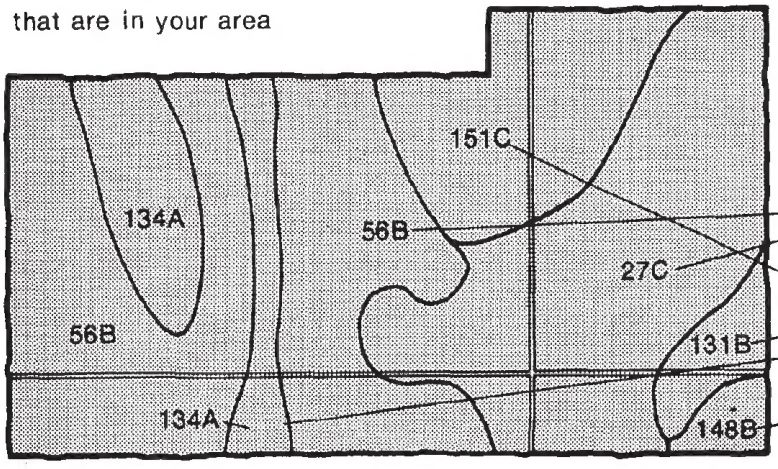
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area

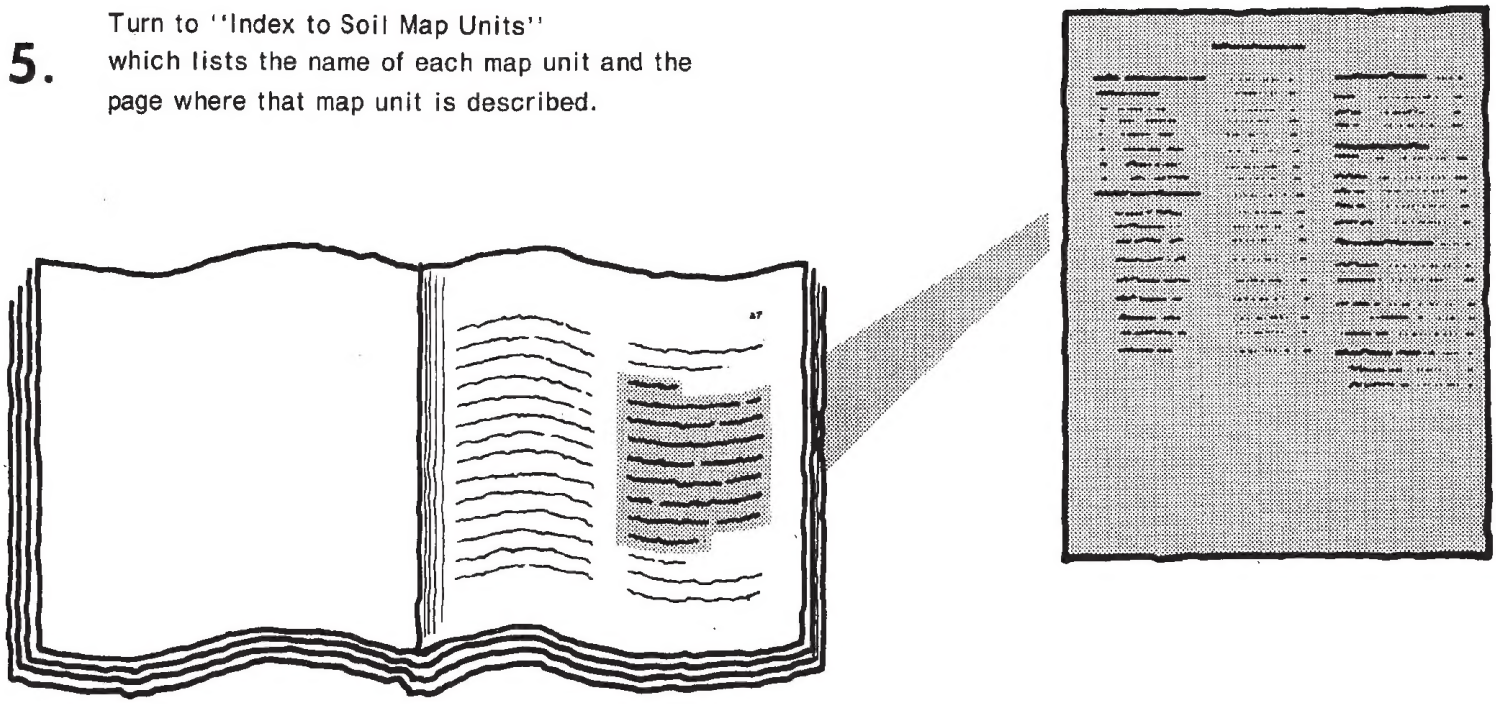


Symbols

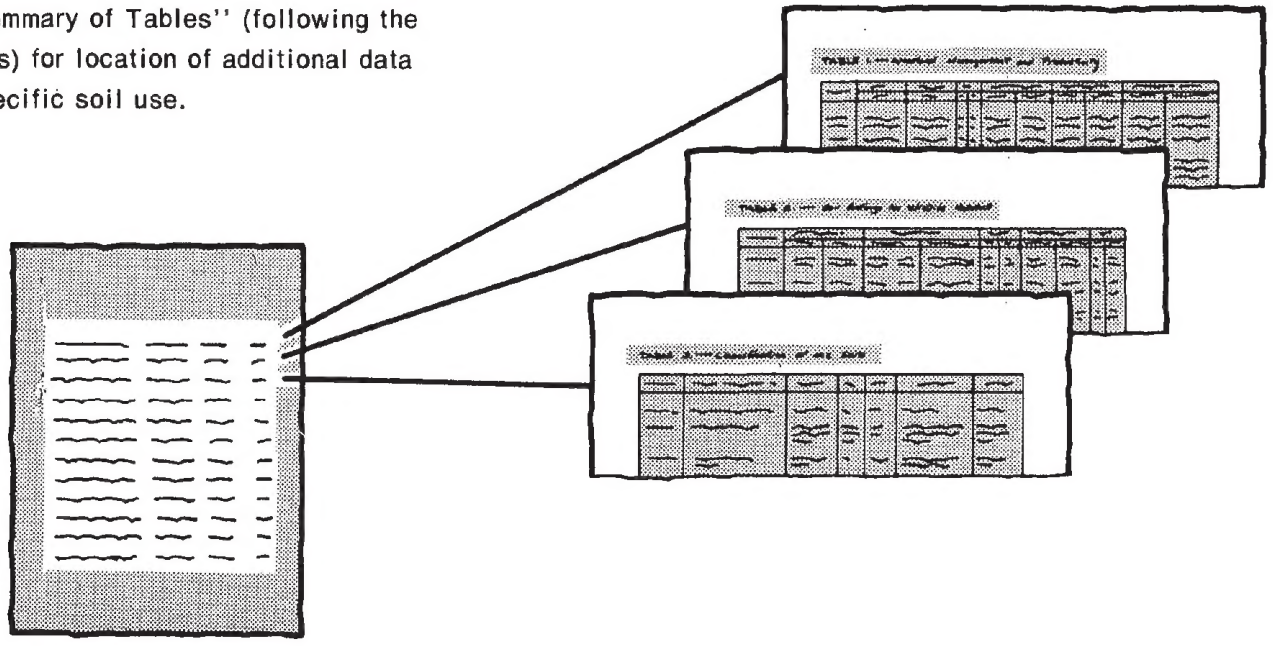
- 27C
- 56B
- 131B
- 134A
- 148B
- 151C

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1966-70. Soil names and descriptions were approved in 1980. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1970. This survey was made cooperatively by the Soil Conservation Service and the Virginia Polytechnic Institute and State University. Additional assistance was provided by the Clarke County Board of Supervisors. This survey is part of the technical assistance furnished to the Lord Fairfax Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: This thoroughbred horse farm on the Poplimento-Timberville map unit provides excellent pasture and is well suited to grain and hay crops.

contents

soil series

Issued September 1982

index to map units

summary of tables

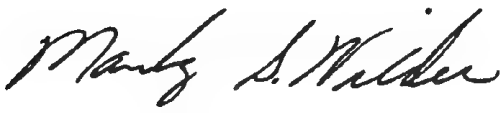
foreword

This soil survey contains information that can be used in land-planning programs in Clarke County, Virginia. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

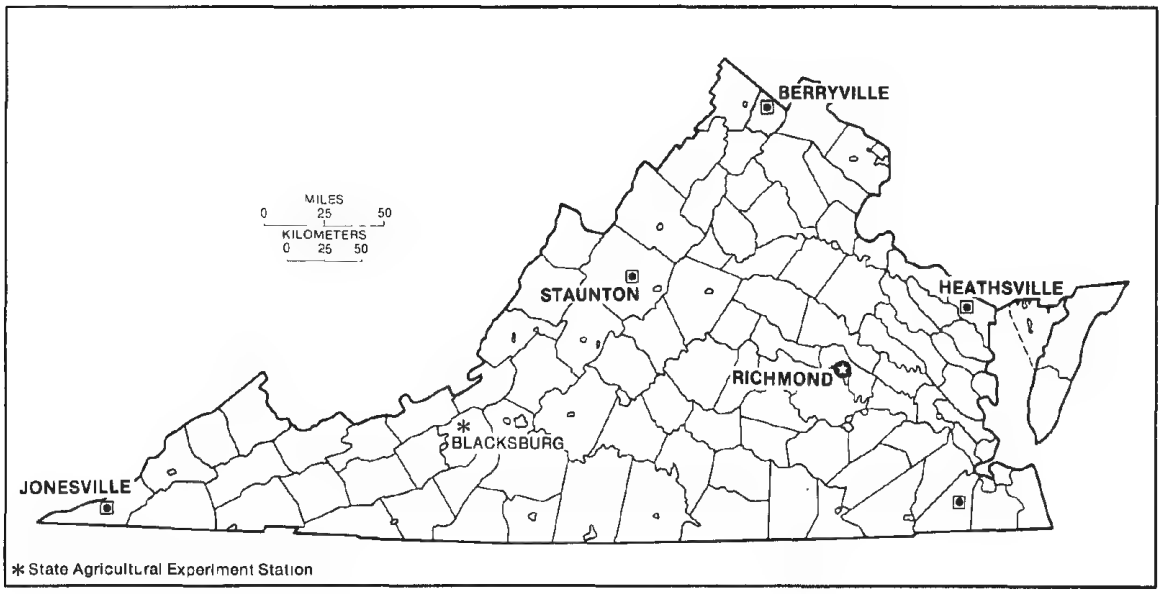
This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.



Manly S. Wilder
State Conservationist
Soil Conservation Service



Location of Clarke County in Virginia.

soil survey of
Clarke County, Virginia

By William J. Edmonds and James Stiegler
of the Virginia Polytechnic Institute and State University

United States Department of Agriculture, Soil Conservation Service
in cooperation with
the Virginia Polytechnic Institute and State University

Clarke County is in northern Virginia in the northern end of the Shenandoah, or Great Valley. The crest of the Blue Ridge Mountains is its eastern border, the Opequon Creek is its western border, Warren County is its southern border, and Jefferson County in West Virginia is its northern border. The Shenandoah River flows along the foot of the mountains and separates the Blue Ridge Mountains from the Shenandoah Valley.

Of the 111,360 acres in Clarke County, approximately three-fourths is in the Shenandoah Valley and one-fourth is in the Blue Ridge Mountains. In 1964 farmland (*5*) covered about 78,000 acres, or about 70 percent of the area. The rest was woodland in the Blue Ridge Mountains. About a third of the farmland is used for crops, about a fourth for pasture, and less than a fifth is in crop and pasture rotations. A little more than 10 percent of the farmland is wooded. Farmsteads, ponds, roads and other nonfarm areas make up the rest.

general nature of the survey area

This section gives general information about the climate, history, industry, community facilities, and water resources of Clarke County.

climate

Winters are cold and snowy at higher elevations in Clarke County. In valleys it is also frequently cold, but intermittent thaws preclude a long-lasting snow cover. Summers are fairly warm on mountain slopes and very warm with occasional very hot days in the valleys. Rainfall is evenly distributed during the year, but it is appreciably heavier on the windward, west-facing slopes than in the valleys. Normal annual precipitation is adequate for all crops, although summer temperature and growing season length, particularly at higher elevations, may be inadequate.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Berryville, Virginia, for the period 1952 to 1978. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 33 degrees F, and the average daily minimum temperature is 23 degrees. The lowest temperature on record, which occurred at Berryville on January 12, 1968, is -13 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 85 degrees. The highest recorded temperature, which occurred on August 31, 1953, is 103 degrees.

Growing degree days, shown in Table 1, are equivalent to heat units. During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 21 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 4.88 inches at Berryville on

September 14, 1966. Thunderstorms occur on about 30 days each year, and most occur in summer.

Average seasonal snowfall is 31 inches. The greatest snow depth at any one time during the period of record was 32 inches. On the average, 17 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The percentage of possible sunshine is 55 percent in summer and 45 percent in winter. The prevailing wind is from the northwest. Average windspeed is highest, 8 miles per hour, in spring.

Heavy rains, which occur at any time of the year, and severe thunderstorms in summer sometimes cause flash flooding, particularly in narrow valleys.

Climatic data for this section were especially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

history

Clarke County, which was formed in 1836 from Frederick County and which later annexed part of Warren County, was named for George Rogers Clark, conqueror of the Northwest Territory. The "e" in the spelling of Clarke is an error which probably will never be corrected. Settlement started in 1725 as people from eastern Virginia and states to the north moved into the area. The road from Snickers Gap in the Blue Ridge to Berryville was one of the earliest to enter the Shenandoah Valley. Berryville, chartered in 1797 under the name of Battletown, became the county seat in 1856.

The county is noted for many fine old colonial and ante-bellum homes and for several interesting old churches. From 1861 to 1865 both Confederate and Union armies moved through Clarke County, and several battles were fought near Berryville. Famous persons associated with the county include Edmund Randolph, who lived at beautiful Carter Hall and served in high federal offices and as Governor of Virginia, and General Daniel Morgan, Revolutionary hero, who built both Soldiers' Rest and Saratoga. Numerous writers and contemporary lawmakers are also native sons.

industry

Agriculture and the processing of agricultural products are the principal sources of income. Fruits, principally apples and peaches, provide about 47 percent of the total farm income, with dairying contributing about 19 percent and other livestock, 28 percent. The remaining farm income is derived from field crops, with poultry and poultry products, forest products, and other horticultural specialties contributing less than 1 percent each. Clarke County is a leading commercial apple-producing county.

Printing and publishing firms are the leading manufacturers in Clarke County, with books the leading product. Other manufacturers produce wooden boxes and crates for shipment of fruit.

Dolomite, which is used for gravel and stone and as a supplement in livestock feed, is quarried from the Tomstown Geologic Formation near Castlemans Ferry Bridge. Marl for agricultural uses is quarried from local deposits of calcite and aragonite along streams.

community facilities

U.S. Highway 340 runs northeast-southwest through Clarke County, connecting Berryville with Front Royal and with Charles Town, West Virginia. U.S. Highways 17 and 50 cross the southern part of the county, connecting it with Winchester and Washington, D.C. Virginia Highway 7 crosses the northern part of the county and connects Berryville with Winchester, Leesburg, and Washington, D.C. Highways 7, 17, and 50 connect Clarke County with Interstates 81 and 495.

Freight service for the county is handled by 16 interstate carriers. Passenger bus service is scheduled daily between Washington, D.C., and Winchester, from which points connections may be made to other localities. Charter, freight, and express package service is also available through the bus company.

The nearest commercial airports are Dulles International and Washington National, located about 40 and 70 miles, respectively, from Berryville. Complete passenger, air express, and air freight services are available.

water resources

Good quality well water is available in both the Shenandoah Valley and the Blue Ridge Mountains of Clarke County. The Shenandoah Valley part of the county is underlain by folded sedimentary strata of limestone, dolomite, shale, and sandstone. The average well in this area is approximately 200 feet deep and yields about 10 to 15 gallons of water per minute. Yields range from 1 to 360 gallons per minute, and several wells 750 to 800 feet deep yield 1 to 20 gallons per minute. The water is of good chemical quality, except for hardness. This hardness is typical of ground water in limestone areas. It has an average temperature of about 54 degrees F.

The crest of the Blue Ridge Mountains in Clarke County is underlain by igneous metabasalts or greenstone, which generally yields less than 10 gallons per minute of excellent quality water. The foothills are underlain by folded sedimentary strata of quartzite, sandstone, phyllite, and shale, which are more productive than the greenstone but do not yield large quantities of water.

The major suppliers of surface water in Clarke County are the Shenandoah River, which crosses the county

from southwest to northeast, and the Opequon Creek, which forms the western boundary of the county. The water supplied is fairly hard, because these streams drain large areas underlain by limestone and dolomite formations in the Shenandoah Valley.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Use of the general soil map for certain broad interpretations can be facilitated by information about the slope and aspect of soils. Slope is important because it affects soil properties and interpretations, including the rate of erosion and the use of equipment. Aspect, which determines the exposure of soils to the sun's rays, is the azimuth, or compass direction that the slope faces. Differences in aspect can account for differences in soil temperature, soil moisture, and vegetative cover.

Information about slopes and their aspect has been developed for most of the general soil map units in Clarke County based on topographic maps. Table 4 gives information about the distribution of slope classes and aspect for areas of a square mile. The process tabulates six slope classes against eight azimuths and gives the marginal total and cumulative percentages. This information can be used for many interpretations needed for preliminary land planning, and particularly for the initial planning for woodland management of large areas.

soil descriptions

areas on uplands in the Shenandoah Valley

These areas are the most extensive in the county. They are mainly in the Ridge and Valley physiographic province that includes nearly all of the major population centers and most of the better farmland in the county. Most of the soils have formed in residuum from sedimentary rocks.

1. Berks-Endcav-Weikert

Shallow to deep, well drained soils that have a loamy or clayey subsoil and formed in materials weathered from shale or calcareous shale; on uplands

This map unit is about 70 percent gently sloping to rolling soils and about 30 percent hilly to steep soils. Coarse fragments are numerous on the surface in many areas.

This map unit makes up about 3 percent of the county. The unit is about 29 percent Berks soils, 20 percent Endcav soils, 12 percent Weikert soils, and 39 percent soils of minor extent.

The Berks soils are mostly on ridges and sloping side slopes. They are moderately deep and well drained and typically have a surface layer of shaly silt loam. The Endcav soils are on ridges and sloping side slopes. They are deep and well drained and typically have a surface layer of silty clay loam. The Weikert soils are on steep side slopes. They are shallow and well drained and typically have a surface layer of shaly silt loam.

The soils of minor extent are mainly the somewhat poorly drained Berks Variant soils, the well drained Chagrin soils, and the excessively drained Dandridge soils. The Berks Variant soils are seasonally wet and are in heads of drainageways and in upland depressions. The Chagrin soils are along drainageways and are occasionally flooded by stream overflow. The Dandridge soils are shallow to bedrock and are on ridges and narrow side slopes.

This Berks-Endcav-Weikert map unit is used mainly for pasture and woodland. It is about 70 percent gently sloping to sloping soils on ridges and flood plains. They have been cleared and are used mainly for pasture, although some areas are in row crops, such as corn, small grains, or hay. The remaining 30 percent of the unit ranges from rolling to hilly and steep and is mainly in woodland.

This unit has many limitations for farming. Most of the soils have low and very low available water capacity and limited rooting depth. Also, the Berks and Weikert soils are generally acid, have low natural fertility, and have coarse fragments on the surface.

These soils have many limitations for residential and community development. The Berks and Weikert soils are moderately deep or shallow to bedrock. They have a high content of shale, and their subsoil is moderately permeable. The Endcav soils have a clayey subsoil with slow permeability, high shrink-swell potential, and low strength.

2. Carbo-Opequon-Oaklet

Shallow to deep, well drained soils that have a clayey subsoil and formed in materials weathered from limestone; on uplands

This map unit is about 35 percent nearly level soils and 65 percent gently sloping soils. Rock outcrop and sinkholes are numerous throughout the map unit.

This map unit makes up about 9 percent of the county. The unit is about 24 percent Carbo soils, 22 percent Opequon soils, 18 percent Oaklet soils, and 36 percent soils of minor extent.

The Carbo soils are on complex ridges and rolling side slopes. They are moderately deep and well drained and generally have a surface layer of silty clay loam. The Opequon soils are on complex ridges and rolling side slopes and generally are near outcrops of limestone bedrock. They are shallow to bedrock and well drained and have a surface layer of silty clay. The Oaklet soils are on the smoother ridges. They are deep and well drained and have a surface layer of silt loam.

The soils of minor extent are mainly the moderately well drained Hollywood and Pagebrook soils and the well drained Timberville soils. The Hollywood soils are in drainageways. The Pagebrook and Timberville soils are along drainageways and in upland depressions or sinkholes. They receive seepage and runoff from the higher slopes.

This Carbo-Opequon-Oaklet map unit is about 85 percent nearly level and gently sloping ridges and intermittent drainageways that have been cleared and used for pasture and row crops. Cultivated crops include corn, small grains, alfalfa, and hay. The remaining 15 percent is nearly level and gently sloping soils that are wooded and are usually too rocky to be managed for pasture.

Farming is limited because many of these soils have low available water capacity and shallow rooting depth. Also, about half the map unit has outcrops of limestone bedrock that limit the use of machinery in preparing seedbeds and cultivating and harvesting row crops. Where there are no rock outcrops or where rocks are more than 100 feet apart, the soils are generally cultivated.

These soils have many limitations for residential and community development. Most of them have a clayey subsoil that has high shrink-swell potential and low strength. About 80 percent of this unit has outcrops of limestone bedrock less than 300 feet apart. The Carbo and Opequon soils are extremely variable in depth to bedrock, which affects the location and design of septic tank absorption fields, pipelines, and dwellings with basements. The numerous sinkholes and solution channels in the bedrock may result in the contamination of wells and springs by surface runoff and seepage from septic tank absorption fields.

3. Rock outcrop-Opequon-Swimley

Areas of Rock outcrop and shallow and deep, well drained soils that have a clayey subsoil and all formed in materials weathered from limestone; on uplands

This map unit is 60 percent nearly level soils and 40 percent gently sloping soils. Rock outcrop and sinkholes are numerous throughout the map unit.

This map unit makes up about 6 percent of the county. The unit is about 36 percent Rock outcrop, 27 percent Opequon soils, 16 percent Swimley soils, and 21 percent soils of minor extent.

The Rock outcrop is mainly limestone and dolomite. The Opequon soils are on complex ridges and rolling side slopes and generally are near outcrops of limestone bedrock. They are shallow and well drained and generally have a surface layer of silty clay. The Swimley soils are on smooth ridges and side slopes. They are deep and well drained and generally have a surface layer of silt loam.

The soils of minor extent are mainly the well drained Hagerstown and Timberville soils and the moderately well drained Pagebrook soils. The Hagerstown soils are similar in location to the Swimley and Opequon soils. The Timberville and Pagebrook soils are along drainageways and in sinkholes and receive seepage and runoff from the higher slopes.

This Rock outcrop-Opequon-Swimley map unit is used mainly for pasture and some row crops. Cultivated crops include corn, small grains, alfalfa, and hay crops. About 75 percent of this unit is nearly level and gently sloping ridges and intermittent drainageways that have been cleared and are used for pasture. Areas that do not have limestone rock outcrops or that have rock outcrops more than 100 feet apart are generally cultivated. About 25 percent of the unit is nearly level and gently sloping soils that are wooded and are usually too rocky to be managed for pasture.

The unit has two main limitations for farming. The shallow soils have low available water capacity, and, in two-thirds of the unit, outcrops of limestone bedrock limit the use of machinery in seedbed preparation and in cultivating and harvesting row crops.

This unit has many limitations for residential and community development. Most of the soils have a clayey subsoil with a high shrink-swell potential and low strength. About 80 percent of this unit has rock outcrops less than 300 feet apart. Depth to limestone bedrock is extremely variable and affects the location and design of

septic tank absorption fields, pipelines, and dwellings with basement. The numerous sinkholes (fig. 1) and solution channels in the bedrock may result in the contamination of wells and springs by surface runoff and seepage from septic tank absorption fields.

4. Rock outcrop-Hagerstown-Swimley

Areas of Rock outcrop and deep, well drained soils that have a clayey subsoil and formed in materials weathered from limestone; on uplands

This map unit is about 20 percent nearly level soils and 80 percent gently sloping soils. Rock outcrop and sinkholes are numerous throughout the map unit.

This map unit makes up about 14 percent of the county. The unit is about 22 percent Rock outcrop, 17 percent Hagerstown soils, 17 percent Swimley soils, and 44 percent soils of minor extent.

The Rock outcrop is mainly limestone and some dolomite. The Hagerstown soils are on complex ridges and rolling side slopes. They are deep and well drained and generally have a surface layer of silt loam. The Swimley soils are on smooth ridges and side slopes. They are deep and well drained and generally have a surface layer of silt loam.

The soils of minor extent are mainly the well drained Opequon and Timberville soils and the moderately well drained Pagebrook soils. The Opequon soils are generally near rock outcrops. The Pagebrook and

Figure 1.—A small stream flows into this sinkhole in an area of Swimley-Hagerstown silt loams, rocky, 3 to 8 percent slopes

Timberville soils are along drainageways and in sinkholes and receive seepage and runoff from the higher slopes.

This Rock outcrop-Hagerstown-Swimley map unit is used mainly for pasture and some row crops. Cultivated crops include corn, small grains, alfalfa, and hay crops. About 65 percent of this unit is nearly level and gently sloping soils on ridges and intermittent drainageways that have been cleared and are used for pasture. Areas that do not have limestone rock outcrops or that have rock outcrops more than 100 feet apart are generally cultivated. About 35 percent of the unit is nearly level and gently sloping soils that are wooded and are usually too rocky to be managed for pasture.

The unit has two main limitations for farming. The shallow soils have low available water capacity, and outcrops of limestone bedrock in about half this unit limit the use of machinery in seedbed preparation and in cultivating and harvesting row crops.

These soils have many limitations for residential and community development. Most of them have a clayey subsoil that has a high shrink-swell potential and low strength. About 70 percent of this unit has rock outcrops less than 300 feet apart. Depth to bedrock is variable and affects the location and design of septic tank absorption fields, pipelines, and dwellings with basements. The numerous sinkholes and solution channels in the bedrock may result in the contamination of wells and springs from surface runoff and seepage from septic tank absorption fields.

5. Poplimento-Timberville

Deep, well drained soils that have a clayey or loamy subsoil and formed in materials weathered from interbedded limestone, shale, and siltstone or colluvium; on uplands

This map unit is about 70 percent gently sloping soils and 30 percent rolling soils. Rock outcrop and sinkholes are numerous throughout the map unit.

This map unit makes up about 20 percent of the county. The unit is about 43 percent Poplimento soils, 22 percent Timberville soils, and 35 percent minor soils.

The Poplimento soils are mostly on ridges and side slopes. They are deep and well drained and typically have a surface layer of silt loam. The Timberville soils are along upland drainageways. They are deep and well drained and have a surface layer of silt loam. These Timberville soils receive runoff from the higher slopes.

The soils of minor extent are mainly the well drained Duffield soils and the moderately well drained Nicholson, Hollywood, and Pagebrook soils. The Duffield and Nicholson soils are similar in location to the Poplimento soils. The Hollywood and Pagebrook soils are along drainageways and receive seepage and runoff from the higher slopes.

This Poplimento-Timberville map unit is well suited to farming and is used mainly for row crops and pasture. Cultivated crops include corn, small grains, alfalfa, and hay crops. A large acreage is used for apple and peach orchards. About 45 percent of this unit is gently sloping and rolling soils that do not have rock outcrops or that have rock outcrops more than 300 feet apart. About 25 percent has rock outcrops 100 to 300 feet apart. About 30 percent has so many rock outcrops that they limit the use of machinery in seedbed preparation and in cultivating and harvesting row crops. These soils, however, are well suited to pasture.

These soils have many limitations for residential and community development. Most of them have a clayey subsoil with a high shrink-swell potential and low strength. Permeability is generally moderately slow and should be considered when designing septic tank absorption fields. The numerous sinkholes and solution channels in the bedrock may result in the contamination of wells and springs by surface runoff and seepage from septic tank absorption fields.

6. Poplimento-Webbtown-Timberville

Deep or moderately deep, well drained soils that have a clayey or loamy subsoil and formed in materials from interbedded limestone, shale, and siltstone or colluvium; on uplands

This map unit is about 40 percent gently sloping soils, 45 percent rolling soils, and 15 percent hilly soils. Rock outcrop and sinkholes are numerous throughout the unit.

This map unit makes up about 19 percent of the county. The unit is about 28 percent Poplimento soils, 18 percent Webbtown soils, 15 percent Timberville soils, and 39 percent soils of minor extent.

The Poplimento soils are on smooth ridges and side slopes (fig. 2). They are deep and well drained and generally have a surface layer of silt loam. The Webbtown soils are on complex ridges and side slopes. They are generally moderately deep and well drained and have a surface layer of shaly silt loam. The Timberville soils are along upland drainageways. They are deep and well drained and generally have a surface layer of silt loam. Timberville soils receive runoff from higher slopes.

The soils of minor extent are mainly the well drained Duffield soils, the moderately well drained Nicholson and Weaver soils, and the somewhat poorly drained McGary soils. The Duffield and Nicholson soils are similar in location to the Poplimento and Webbtown soils. The McGary soils are along drainageways, and they are seasonally wet. The Weaver soils are along

Figure 2.—Landscape in the Poplimento-Webbtown-Timberville map unit. Poplimento soils are on the smoother ridges and side slopes, Webbtown soils on the more undulating ridges and side slopes, and Timberville soils along drainageways.

drainageways below limestone springs and they are seasonally wet (fig. 3).

This Poplimento-Webbtown-Timberville map unit is well suited to farming, and nearly all of the unit has been cleared and is used for row crops. The remainder is mainly in pasture or in apple and peach orchards. About 60 percent of this map unit is gently sloping and rolling soils that do not have rock outcrops or that have rock outcrops more than 300 feet apart. About 30 percent is gently sloping, rolling, and hilly soils that have rock outcrops 100 to 300 feet apart. About 10 percent has so many rock outcrops that they limit the use of machinery in seedbed preparation and in cultivating and harvesting row crops. These rocky soils are mainly in pasture or in woodland.

These soils have many limitations for residential and community developments. Most of the soils have a high clay content, low strength, and a moderate shrink-swell potential in the subsoil, which affect the design of foundations and roads. The variable depth to bedrock affects the location and design of septic tank absorption fields and dwellings with basements. Sinkholes and solution channels in the bedrock may result in the contamination of wells and springs by surface runoff and seepage from septic tank absorption fields.

areas on river terraces and flood plains in the Shenandoah Valley

These areas are mostly along the Shenandoah River in the Ridge and Valley physiographic province and include some of the better farmland in the county. Most of the soils formed in alluvium deposited by the Shenandoah River or in residuum weathered from adjacent uplands.

Figure 3.—Spring on Weaver silt loam in an area of limestone bedrock.

7. Monongahela-Braddock-Webbtown

Deep or moderately deep, moderately well drained or well drained soils that have a loamy or clayey subsoil and formed in alluvium or residuum of interbedded limestone, shale, and siltstone; on stream terraces and adjacent uplands

This map unit is about 50 percent gently sloping soils, about 30 percent rolling soils, about 10 percent hilly soils, and about 10 percent steep soils. Gravel and cobblestones are on the surface in many areas.

This map unit makes up about 4 percent of the county. The unit is about 30 percent Monongahela soils, 30 percent Braddock soils, 20 percent Webbtown soils, and 20 percent soils of minor extent.

The Monongahela soils are on smooth ridges and side slopes (fig. 4). They are deep and moderately well drained and have a loam or cobbly loam surface layer. The Braddock soils are on ridges and side slopes. They are deep and well drained and have a loam or gravelly loam surface layer. The Webbtown soils are on the steeper side slopes. They are generally moderately deep and well drained and have a surface layer of shaly silt loam.

The soils of minor extent are mainly the well drained Poplimento, Thurmont, and Dekalb soils; the moderately well drained Zoar soils; and Udults and Udalfs. The Thurmont and Zoar soils are similar in location to the Monongahela and Braddock soils, but they contain fewer cobblestones and gravel. The Poplimento soils have a clay subsoil and are on rolling and steep side slopes. The Dekalb soils are on steep side slopes. The Udults and Udalfs are on steep side slopes and escarpments.

This Monongahela-Braddock-Webbtown map unit is used mostly for woodland, but some areas are fairly well suited to farming. About half of the gently sloping and rolling soils have been cleared and are used for cultivated crops or pasture. The high content of cobblestones and gravel interferes with cultivation, and the low available water capacity, acidity, low natural

fertility, and shallow rooting depth in soils with a fragipan often limit productivity. However, crops on these soils respond to good management when moisture is not a limiting factor.

These soils have many limitations for residential and community developments. Permeability is generally moderate to slow. The Monongahela soils have a perched water table above a slowly permeable fragipan. These soil properties affect the location and design of septic tank absorption fields and dwellings with basements. A high content of cobblestones and gravel limits many residential and urban uses of these soils.

8. Chagrin-Udipsamments-Lobdell

Deep, excessively drained to moderately well drained soils that are loamy or sandy throughout and formed in alluvium; on flood plains

This map unit is nearly level. It is occasionally flooded for brief periods.

This map unit makes up about 2 percent of the county. The unit is about 37 percent Chagrin soils, 32 percent Udipsamments, 12 percent Lobdell soils, and 19 percent soils of minor extent.

The Chagrin soils are deep, nearly level, and well drained. They have a fine sandy loam or silt loam surface layer. The Udipsamments are deep, nearly level, and moderately well to excessively drained. They have a sandy surface layer. The Lobdell soils are deep, nearly level, and moderately well drained. They have a surface layer that ranges from fine sandy loam to silt loam.

The soils of minor extent are mainly the well drained Thurmont soils, the excessively drained Lakin soils, and the moderately well drained Monongahela and Zoar soils. These soils are on gently sloping to rolling low terraces. The Monongahela soils have a fragipan in the subsoil, and the Zoar soils are seasonally wet.

This Chagrin-Udipsamments-Lobdell map unit is well suited to farming, and most areas have been cleared and are used for cultivated crops or pasture. Cultivated

Figure 4.—Landscape with the Monongahela-Braddock-Webbtown map unit in the foreground and the Dekalb-Laidig map unit in the background.

crops are mainly corn, small grains, and hay. Flooding occasionally limits yields and is a severe limitation for residential and community development.

areas on uplands in the Blue Ridge Mountains

These areas are mostly in the Blue Ridge physiographic province and include some of the roughest, steep parts of the county. They are mainly woodland. The soils formed in residuum or colluvium from sedimentary and metamorphic rocks.

9. Dekalb-Laidig

Moderately deep or deep, well drained soils that have a loamy subsoil and formed in materials weathered from sandstone; on upland side slopes

This map unit is about 10 percent gently sloping soils, 30 percent sloping soils, 30 percent hilly soils, and 30 percent steep soils. About half of the unit has a west, northwest, or north aspect (table 4).

This map unit makes up about 10 percent of the county. The unit is about 32 percent Dekalb soils, 19 percent Laidig soils, and 49 percent soils of minor extent.

The Dekalb soils are on sloping to steep side slopes. They are moderately deep and well drained and have a surface layer of channery or very stony sandy loam. The Laidig soils are in hilly to steep drainageways, on toe slopes, and on colluvial fans. They are deep and well drained and generally have a surface layer of channery or very stony loam. These Laidig soils have a fragipan in the subsoil.

The soils of minor extent are mainly the well drained Cardiff, Clymer, and Lew soils and the excessively drained Cataska soils. The Cardiff and Cataska soils formed on ridges and side slopes. The Clymer soils are on ridges. The Lew soils are similar in location to the Laidig soils.

This Dekalb-Laidig map unit is used mostly for woodland. These soils have many limitations for farming—low available water capacity, shallow rooting depth, high content of coarse fragments, acidity, low natural fertility, and slope. More than half the map unit is hilly to steep.

These soils have many limitations for residential and community developments. Slope, high content of coarse fragments, and moderate or moderately slow permeability affect the location and design of septic tank absorption fields and dwellings with basements.

10. Cardiff-Cataska-Whiteford

Deep to shallow, well drained or excessively drained soils that have a loamy subsoil and formed in materials weathered from phyllites and slates; on uplands

This map unit is about 15 percent gently sloping soils, 40 percent sloping soils, 35 percent hilly soils, and 10 percent steep soils. More than half this unit has a west, northwest, or north aspect (table 4).

This map unit makes up about 5 percent of the county. The unit is about 26 percent Cardiff soils, 17 percent Cataska soils, 15 percent Whiteford soils, and 42 percent soils of minor extent.

The Cardiff soils are on gently sloping ridges to steep side slopes. They are deep and well drained and generally have a surface layer of slaty loam. The Cataska soils are on steep side slopes. They are shallow and excessively drained and generally have a surface layer of slaty loam. The Whiteford soils are on gently sloping ridges. They are deep and well drained and generally have a surface layer of silt loam.

The soils of minor extent are mainly the well drained Laidig and Lew soils. These soils are in concave heads of drainageways, on toe slopes, and on colluvial fans.

This Cardiff-Cataska-Whiteford map unit is used mainly for woodland. The soils have many limitations for farming. Most of them have low available water capacity, shallow rooting depth, high content of coarse fragments, acidity, and low natural fertility. Also, about 40 percent of the soils are hilly to steep.

These soils have many limitations for residential and community developments. Slope, depth to bedrock, and a high content of slate fragments affect the location and design of septic tank absorption fields and dwellings with basements.

11. Catoctin-Myersville-Lew

Moderately deep or deep, well drained soils that have a loamy subsoil and formed in materials weathered from greenstone residuum or colluvium from greenstone; on uplands

This map unit is about 25 percent sloping soils, 45 percent moderately steep soils, and 30 percent steep and very steep soils.

This map unit makes up about 8 percent of the county. The unit is about 26 percent Catoctin soils, 21 percent Myersville soils, 20 percent Lew soils, and 33 percent soils of minor extent.

The Catoctin soils are mostly on ridges and side slopes. They are moderately deep and well drained and generally have a surface layer of cobbly or very stony silt loam. The Myersville soils are on ridges and side slopes. They are deep and well drained and have a surface layer of channery or very stony silt loam. The Lew soils are in heads of drainageways, on toe slopes and on colluvial fans. They are deep and well drained and generally have a surface layer of very stony silt loam.

The soils of minor extent are mainly the well drained Laidig, Dekalb, and Cardiff soils. The Laidig soils are on toe slopes and colluvial fans, and they have a fragipan in the subsoil. The Dekalb soils are on ridges and formed in materials weathered from sandstone and quartzite. The Cardiff soils are on ridges and formed in materials weathered from slate and phyllites.

This Catoctin-Myersville map unit is used mostly for woodland. These soils have many limitations for farming. Nearly all have stones and boulders that interfere with seedbed preparation and with cultivating and harvesting row crops. Also, about 75 percent of this unit is hilly or steep.

Stones and boulders on the surface and hilly or steep slopes limit the residential and community development of these soils.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Dekalb very strong sandy loam, 8 to 30 percent slopes, is one of several phases in the Dekalb series.

Some map units are made up of two or more major soils. These map units are called soil complexes or soil associations.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Monongahela-Braddock complex is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Udults-Udalfs association is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, sand and gravel, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

1B—Berks-Berks Variant shaly silt loams, 3 to 8 percent slopes. This gently sloping complex consists of moderately deep, well drained Berks soils and moderately deep, somewhat poorly drained Berks Variant soils. These soils are on moderately broad ridges in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. This map unit is about 45 percent Berks soils, 35 percent Berks Variant soils, and 20 percent other soils. Slopes are smooth and about 500 to 1,000 feet long. Areas of this complex are long and winding and range from about 10 to 100 acres.

Typically, the surface layer of the Berks soil is dark yellowish brown shaly silt loam about 7 inches thick. The subsoil extends to a depth of 25 inches. It is yellowish brown shaly silt loam. The substratum is brownish yellow very shaly silt loam about 9 inches thick. Rippable shale bedrock is at a depth of 34 inches.

Typically, the surface layer of the Berks Variant soil is dark yellowish brown shaly silt loam about 8 inches thick. The subsoil extends to a depth of 24 inches. It is yellowish brown shaly silt loam mottled with light olive

gray. The substratum is yellowish brown very shaly silt loam that is mottled gray and black. Rippable shale bedrock is at a depth of 32 inches.

Included with these soils in mapping are small intermingled areas of the Dandridge, Timberville, and Weikert soils. The Dandridge soils are similar in location to the Berks and Berks Variant soils. The Timberville soils are in depressions and along narrow drainageways. The Weikert soils are on steeper side slopes near the boundaries of the map unit. Also included are outcrops of rippable shale bedrock that are generally more than 300 feet apart, soils that have a silt loam or silty clay loam surface layer, and soils that have fewer coarse fragments in the subsoil and are deeper to bedrock.

The permeability of the Berks soils is moderate, and that of the Berks Variant soils is very slow. The available water capacity is very low for both soils. Surface runoff is medium. The erosion hazard is moderate. The surface layer and subsoil of both soils have a large number of shale fragments, and the subsoil of both soils has a low shrink-swell potential. Their root zone extends to bedrock, which ranges from 20 to 40 inches. Both soils are low in natural fertility and moderate in organic matter content. They range from very strongly acid through medium acid unless lime has been applied. The Berks Variant soils have a perched seasonal high water table at a depth of 1/2 foot to 1 1/2 feet from September through May.

About half this complex is in pasture. The remainder is mostly in woodland with a small acreage in cultivated crops.

This Berks-Berks Variant complex is moderately well suited to cultivated crops. The major limitations are very low available water capacity, shallow rooting depth, acidity, and low natural fertility. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is only fair because of the high content of shale fragments in the surface layer. Crop yields can be increased by applying lime and fertilizer if rainfall is adequate throughout the growing season.

This complex is poorly suited to fruits, nuts, and berries. The major limitations are very low available water capacity, shallow rooting depth, acidity, and low natural fertility. Very low available water capacity, especially, reduces the size of fruit and limits the development of fruit buds.

This complex is moderately well suited to pasture. Limitations are very low available water capacity, acidity, and low natural fertility. Establishing and maintaining a mixture of grasses and legumes, proper stocking, rotating pastures, deferring grazing, controlling weeds, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Berks-Berks Variant soils for trees is moderately high. Seedling survival and growth are limited by the very low available water capacity and the high content of shale fragments.

The depth to bedrock in both soils and wetness of the Berks Variant soils limit the use of this complex for septic tank absorption fields, sewage lagoons, sanitary landfills, dwellings with basements, and shallow excavations. Also, the high content of coarse fragments in both soils limits their use for cover for landfills, lawns, and most types of recreation.

This Berks-Berks Variant complex is in capability subclass IIe.

1C—Berks-Berks Variant shaly silt loams, 8 to 15 percent slopes. This rolling complex consists of moderately deep, well drained Berks soils and moderately deep, somewhat poorly drained Berks Variant soils. These soils are on narrow side slopes in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. This map unit is about 50 percent Berks soils, 30 percent Berks Variant soils, and 20 percent other soils. Slopes are complex and about 100 to 400 feet long. Areas of this complex are long and winding and range from about 5 to 25 acres.

Typically, the surface layer of the Berks soil is dark yellowish brown shaly silt loam about 5 inches thick. The subsoil extends to a depth of 18 inches. It is yellowish brown shaly silt loam. The substratum is brownish yellow very shaly silt loam. Rippable shale bedrock is at a depth of 22 inches.

Typically, the surface layer of the Berks Variant soil is dark yellowish brown shaly silt loam about 6 inches thick. The subsoil extends to a depth of 20 inches. It is yellowish brown shaly silt loam mottled with light olive gray. The substratum is yellowish brown very shaly silt loam that is mottled with gray and black. Rippable shale bedrock is at a depth of 23 inches.

Included with these soils in mapping are small intermingled areas of the Dandridge, Timberville, and Weikert soils. The Dandridge soils are similar in location to the Berks and Berks Variant soils. The Timberville soils are in depressions and along narrow drainageways. The Weikert soils are on steeper side slopes near the boundaries of the map unit. Also included are outcrops of rippable shale bedrock that are generally more than 300 feet apart and soils with a silt loam or silty clay loam surface layer.

The permeability of the Berks soils is moderate, and the permeability of this Berks Variant soil is very slow. The available water capacity is very low for both soils, and surface runoff is rapid. The erosion hazard is severe. The surface layer and subsoil of both soils have a large number of shale fragments, and the subsoil of both soils has a low shrink-swell potential. Their root zone extends to bedrock, which ranges from 20 to 40 inches. Both soils are low in natural fertility and moderate in organic matter content. They range from very strongly acid

through medium acid unless lime has been applied. The Berks Variant soils have a perched seasonal high water table at a depth of 1/2 foot to 1 1/2 feet from September through May.

About half this complex is in pasture. The remainder is mostly in woodland with a small acreage in cultivated crops.

This Berks-Berks Variant complex is poorly suited to cultivated crops. The major limitations are very low available water capacity, shallow rooting depth, acidity, and low natural fertility. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is only fair because of the high content of shale fragments in the surface layer. Crop yields can be increased by applying lime and fertilizer if rainfall is adequate throughout the growing season.

This complex is poorly suited to fruits, nuts, and berries. The major limitations are very low available water capacity, shallow rooting depth, acidity, and low natural fertility. Very low available water capacity, especially, reduces the size of fruit and limits the development of fruit buds.

This complex is moderately well suited to pasture. Limitations are very low available water capacity, acidity, and low natural fertility. Establishing and maintaining a mixture of grasses and legumes, proper stocking, rotating pastures, deferring grazing, controlling weeds, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Berks-Berks Variant soils for trees is moderately high. Seedling survival and growth are limited by the very low available water capacity and the high content of shale fragments.

Depth to bedrock and slope in both soils and wetness in the Berks Variant soils limit the use of this complex for septic tank absorption fields, sewage lagoons, sanitary landfills, dwellings with basements and shallow excavations. Also, the high content of coarse fragments in both soils limits their use for cover for landfills, lawns, and most types of recreation.

This Berks-Berks Variant complex is in capability subclass IIIe.

2B—Braddock loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on moderately broad, low-lying ridges in the foothills of the Blue Ridge Mountains and on stream terraces in the Shenandoah Valley. Slopes are smooth and about 100 to 500 feet long. Areas of this soil are long and winding and range from about 5 to 50 acres.

Typically, the surface layer of this Braddock soil is black loam about 2 inches thick. The subsurface layer is yellowish brown loam 9 inches thick. The subsoil extends to a depth of 74 inches. It is mostly red clay loam and dark red clay to a depth of 42 inches. Below this it is dark red cobbly clay and red cobbly clay loam with olive and brown mottles.

Included with this soil in mapping are small intermingled areas of the Hagerstown, Monongahela, and Poplimento soils. The Hagerstown and Poplimento soils are near the boundaries of the unit. The Monongahela soils are similar in location to the Braddock soils. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Braddock soil is moderate, and the available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer is friable and is easily tilled through a variety of moisture conditions. The subsoil is sticky, plastic clay with a moderate shrink-swell potential. The thickness of the root zone and depth to bedrock are 60 inches or more. The soil is low in organic matter content and in natural fertility. It is very strongly acid or strongly acid unless lime has been applied.

Most areas of this soil are used for farming. The remaining areas are in woodland.

This Braddock soil is well suited to cultivated crops. The major limitations are acidity and low natural fertility. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Tilth is fair but can be improved and maintained by incorporating organic matter into the soil and by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

The soil is well suited to fruits, nuts, and berries if air drainage is adequate. The major limitations are acidity and low natural fertility. Yields can be increased by applying lime and fertilizer.

This soil is well suited to pasture. Limitations are acidity and low natural fertility. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Braddock soil for trees is high. The high content of clay often limits the use of heavy timber equipment, however, especially during periods of extreme wetness.

The high clay content, low soil strength, and moderate shrink-swell potential are the main limitations to use of this Braddock soil for shallow excavations, dwellings, small commercial buildings, roads and roadfill, and cover for landfills. The moderate permeability in the subsoil limits use of the soil for septic tank absorption fields.

This Braddock soil is in capability subclass IIe.

2C—Braddock loam, 8 to 15 percent slopes. This rolling soil is deep and well drained. It is on narrow side slopes in the foothills of the Blue Ridge Mountains and on stream terraces in the Shenandoah Valley. Slopes are complex and about 100 to 400 feet long. Areas of

this soil are long and winding and range from about 5 to 30 acres.

Typically, the surface layer of this Braddock soil is yellowish brown loam about 7 inches thick. The subsoil extends to a depth of 74 inches or more. It is mostly red clay loam and dark red clay to a depth of 42 inches. Below this it is dark red cobbly clay and red cobbly clay loam with olive and brown mottles.

Included with this soil in mapping are small intermingled areas of the Hagerstown, Monongahela, and Poplimento soils. The Hagerstown and Poplimento soils are near the boundaries of the units. The Monongahela soils are similar in location to the Braddock soils. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Braddock soil is moderate, and the available water capacity is moderate. Surface runoff is rapid. The erosion hazard is severe. The surface layer is friable and is easily tilled through a variety of moisture conditions. The subsoil is sticky, plastic clay with a moderate shrink-swell potential. The thickness of the root zone and depth to bedrock are 60 inches or more. The soil is low in organic matter content and in natural fertility. It is very strongly acid or strongly acid unless lime has been applied.

Most areas of this soil are used for farming. The remaining areas are in woodland.

This Braddock soil is well suited to cultivated crops. The major limitations are acidity and low natural fertility. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff and help control erosion. Tilth is fair but can be improved and maintained by incorporating organic matter into the soil and by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

The soil is well suited to fruits, nuts, and berries if air drainage is adequate. The major limitations are acidity and low natural fertility. Yields can be increased by applying lime and fertilizer.

This soil is well suited to pasture. Limitations are acidity and low natural fertility. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Braddock soil for trees is high. The high content of clay in this soil often limits the use of heavy timber equipment, especially during periods of extreme wetness.

The high clay content, low soil strength, moderate shrink-swell potential, and slope are the main limitations to use of this Braddock soil for shallow excavations, dwellings, small commercial buildings, roads and roadfill, and cover for landfills. The moderate permeability in the subsoil also limits use of the soil for septic tank absorption fields.

This Braddock soil is in capability subclass IIIe.

3D—Braddock very stony loam, 15 to 45 percent slopes. This hilly to very steep soil is deep and well drained. It is on side slopes in the foothills of the Blue Ridge Mountains and on stream terraces in the Shenandoah Valley. Slopes are rough and complex and about 100 to 500 feet long. Areas of this soil are long and winding and range from about 5 to 40 acres. Stones larger than 10 inches in diameter cover roughly 3 to 15 percent of the surface.

Typically, the surface layer of this Braddock soil is yellowish brown loam about 8 inches thick. The subsoil extends to a depth of 74 inches or more. It is mostly red clay loam and dark red clay to a depth of 33 inches. Below this it is dark red cobbly clay and red cobbly clay loam with olive and brown mottles.

Included with this soil in mapping are small intermingled areas of the Cardiff, Hagerstown, Laidig, Monongahela, Cataska, Poplimento, and Webbtown soils. The Cardiff and Cataska soils are on steeper side slopes near the boundaries of the unit in the foothills of the Blue Ridge Mountains. The Hagerstown, Poplimento, and Webbtown soils are near the boundaries of the unit in the Shenandoah Valley. The Laidig and Monongahela soils are similar in location to the Braddock soils. Areas of the included soils make up about 2 percent of this map unit.

The permeability of this Braddock soil is moderate, and available water capacity is moderate. Surface runoff is rapid. The erosion hazard is severe. The surface layer is friable, but slope and stones on the surface restrict tillage. The subsoil is sticky, plastic clay with a moderate shrink-swell potential. The thickness of the root zone and depth to bedrock are 60 inches or more. The soil is low in organic matter content and natural fertility. It is very strongly acid or strongly acid unless lime has been applied.

Most areas of this soil are in woodland. A small acreage is used for pasture.

This Braddock soil is not suited to cultivated crops or to fruits, nuts, and berries. Stones on the surface and slope make the use of machinery for seedbed preparation and for cultivating, spraying, and harvesting crops impracticable.

This Braddock soil is moderately well suited to pasture, especially the smoother slopes. Stones and slope limit the use of machinery, and other limitations are soil acidity and low natural fertility. Rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Braddock soil for trees is high. Slope limits the use of timber harvesting equipment. Placing skid trails on the contour where possible reduces erosion.

Stones on the surface and slope are the major soil limitations. They limit use of this soil for septic tank absorption fields, sewage lagoons, sanitary landfills,

shallow excavations, dwellings, small commercial buildings, roads and streets, and most types of recreation.

This Braddock soil is in capability subclass VIs.

4—Buckton soils. These nearly level soils are deep and well drained. They are on moderately broad flood plains of major streams in the Shenandoah Valley and are characterized by convex levees and concave scour channels. Surface textures are highly variable. They are mostly fine sandy loam, sandy loam, loam, or silt loam along the Shenandoah River and loam, silt loam, or silty clay loam along Opequon Creek. Slopes range from 0 to 3 percent and are complex. Areas of these soils are long and winding and range from about 5 to 75 acres.

Typically, the surface layer of these Buckton soils is brown silty clay loam about 7 inches thick. The substratum extends to a depth of at least 77 inches. It is mostly brown clay loam and loam to a depth of 48 inches. Below this it is mostly brown sandy loam and loam with lime concretions and gastropod and brachiopod shells.

Included with these soils in mapping are small intermingled areas of the Chagrin, Lobdell, and Weaver soils and Udipsamments. The Chagrin soils are similar in location to the Buckton soils. The Lobdell and Weaver soils are in slight depressions, scour channels, and slack-water areas adjacent to the escarpment. The Udipsamments are on levees adjacent to the streams. Areas of the included soils make up about 20 percent of this map unit.

The permeability of these Buckton soils is moderate, and the available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The surface layer is friable and easily tilled. The substratum is slightly plastic and has a low shrink-swell potential. The thickness of the root zone and depth to bedrock are more than 60 inches. These Buckton soils have a moderate organic matter content and are high in natural fertility. They are mildly alkaline or moderately alkaline. These soils are occasionally flooded for very brief periods from December through June.

These Buckton soils are well suited to cultivated crops, and most of the acreage is farmed. However, flooding occasionally damages crops or limits the use of machinery. Tilth is good. Crop yields can be increased by fertilizing, but liming is not needed. Conservation tillage conserves moisture and reduces erosion. Row crops can be grown continuously on these soils.

These soils are poorly suited to fruits, nuts, and berries, mainly because poor air drainage causes the fruit buds to freeze. Also, flooding limits the use of machinery for spraying and controlling weeds.

These Buckton soils are well suited to pasture and hay grasses. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying fertilizer increase the productivity and carrying capacity of pastures.

The potential of these Buckton soils for trees is high; however, most areas are farmed. Occasional flooding limits the use of equipment for managing and harvesting timber.

Flooding is the major limitation for septic tank absorption fields, sanitary facilities, shallow excavations, dwellings, and small commercial buildings. Flooding also limits the use of these soils for camp areas and playgrounds.

These Buckton soils are in capability subclass IIw.

5B—Carbo-Opequon-Rock outcrop complex, 3 to 8 percent slopes. This complex consists of moderately deep Carbo soils, shallow Opequon soils, and outcrops of limestone bedrock. The soils are undulating and well drained and are on broad ridges in the Shenandoah Valley. These soils are so intermingled that it was not practical to map them separately. This map unit is about 30 percent Carbo soils, 25 percent Opequon soils, 25 percent Rock outcrop, and 20 percent other soils. Rock outcrops are roughly 10 to 100 feet apart. Slopes are rough, complex, and about 200 to 1,500 feet long. Areas of this complex are long and winding and range from about 5 to 100 acres.

Typically, the surface layer of the Carbo soil is brown silty clay loam about 7 inches thick. The subsoil extends to a depth of 37 inches. It is mostly yellowish brown clay that is firm, very sticky, and very plastic. Hard limestone bedrock is at a depth of 37 inches.

Typically, the surface layer of the Opequon soil is dark yellowish brown silty clay about 8 inches thick. The subsoil is brown clay that is firm, very sticky, and very plastic. Hard limestone bedrock is at a depth of 17 inches.

Included with this complex in mapping are small intermingled areas of the Duffield, McGary, Nicholson, Oaklet, Pagebrook, and Timberville soils. The Duffield and Nicholson soils are on ridges, in concave heads of drainageways, and in saddles. The McGary, Pagebrook, and Timberville soils are in depressions and along narrow, winding drainageways. The Oaklet soils are similar in location to the Carbo and Opequon soils.

The permeability of the Carbo soils is slow, and that of the Opequon soils is moderately slow. The available water capacity is low in the Carbo soils and very low in the Opequon soils. Surface runoff is medium. The erosion hazard is moderate. The surface layer of both soils has a high clay content and is difficult to till. The subsoil of these soils has a high shrink-swell potential. The thickness of the root zone and depth to bedrock are 20 to 40 inches in the Carbo soils and are 12 to 20 inches in the Opequon soils. Both soils have high natural fertility and low organic matter content. Both soils commonly range from medium acid through mildly alkaline.

About half this complex is in pasture, and the remainder is in woodland.

This Carbo-Opequon-Rock outcrop complex is not suited to cultivated crops or to fruits, nuts, or berries. Rock outcrop severely limits the use of machinery for seedbed preparation and for cultivating, spraying, and harvesting. Also, the low available water capacity in the Carbo soils and the very low available water capacity in the Opequon soils limit the size of fruit and the development of fruit buds.

This complex is moderately well suited to pasture. Rock outcrop limits the use of machinery for managing and improving pasture. Rotating pastures, proper stocking, maintaining a mixture of grasses and legumes, deferring grazing, fertilizing, and controlling weeds increase the productivity and carrying capacity of pastures.

The potential of the Carbo and Opequon soils for trees is moderately high. The high clay content in these soils limits the use of heavy timber equipment, especially during periods of extreme wetness. Rock outcrop also limits the use of timber equipment.

The depth to bedrock, high clay content, high shrink-swell potential, low soil strength, slow permeability in the subsoil, and closely spaced rock outcrops limit the use of this complex for septic tank absorption fields, sanitary landfills, dwellings, roads and streets, and most types of recreation. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields.

This Carbo-Opequon-Rock outcrop complex is in capability subclass VIs.

5C—Carbo-Opequon-Rock outcrop complex, 8 to 15 percent slopes. This complex consists of moderately deep Carbo soils, shallow Opequon soils, and outcrops of limestone bedrock on narrow side slopes in the Shenandoah Valley. The soils are rolling and well drained. They are so intermingled that it was not practical to map them separately. This map unit is about 30 percent Carbo soils, 25 percent Opequon soils, 25 percent Rock outcrop, and 20 percent other soils. Rock outcrops are roughly 100 to 300 feet apart. Slopes are rough, complex, and about 100 to 300 feet long. Areas of this complex are long and winding and range from about 5 to 50 acres.

Typically, the surface layer of the Carbo soil is brown silty clay loam about 6 inches thick. The subsoil extends to a depth of 25 inches. It is mostly yellowish brown clay that is firm, very sticky, and very plastic. Hard limestone bedrock is at a depth of 25 inches.

Typically, the surface layer of the Opequon soil is dark yellowish brown silty clay about 4 inches thick. The subsoil is brown clay that is firm, very sticky, and very plastic. Hard limestone bedrock is at a depth of 14 inches.

Included with this complex in mapping are small intermingled areas of the McGary, Oaklet, Pagebrook, and Timberville soils. The McGary, Pagebrook, and Timberville soils are in depressions and along narrow, winding drainageways. The Oaklet soils are similar in location to the Carbo and Opequon soils.

The permeability of the Carbo soils is slow, and that of the Opequon soils is moderately slow. The available water capacity is low in the Carbo soils and very low in the Opequon soils. Surface runoff is medium. The erosion hazard is moderate. The surface layer of both soils has a high clay content and is difficult to till. The subsoil of both soils has a high shrink-swell potential. The thickness of the root zone and depth to bedrock are 20 to 40 inches in the Carbo soils and are 12 to 20 inches in the Opequon soils. Both soils have high natural fertility and low organic matter content. Both soils commonly range from medium acid through mildly alkaline.

About half this complex is in pasture, and the remainder is in woodland.

This Carbo-Opequon-Rock outcrop complex is not suited to cultivated crops or to fruits, nuts, or berries. Rock outcrop severely limits the use of machinery for seedbed preparation and for cultivating, spraying, and harvesting. Also, the low available water capacity in the Carbo soils and the very low available water capacity in the Opequon soils limit the size of fruit and the development of fruit buds.

This complex is moderately well suited to pasture. Rock outcrop limits the use of machinery for managing and improving pasture. Rotating pastures, proper stocking, maintaining a mixture of grasses and legumes, deferring grazing, fertilizing, and controlling weeds increase the productivity and carrying capacity of pastures.

The potential of the Carbo and Opequon soils for trees is moderately high. The high clay content in these soils limits the use of heavy timber equipment, especially during periods of extreme wetness. Rock outcrop also limits the use of timber equipment.

The depth to rock, slope, high clay content, high shrink-swell potential, low soil strength, slow permeability in the subsoil, and closely spaced rock outcrops limit the use of this complex for septic tank absorption fields, sanitary landfills, dwellings, roads and streets, and most types of recreation. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields.

This Carbo-Opequon-Rock outcrop complex is in capability subclass VIIs.

6B—Cardiff slaty loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on narrow ridges in the foothills of the Blue Ridge Mountains. Slopes are smooth and about 100 to 500

feet long. Areas of this soil are long and winding and range from about 5 to 100 acres.

Typically, the surface layer of this Cardiff soil is very dark gray slaty loam 1 inch thick, and the subsurface layer is pale brown slaty loam to a depth of 7 inches. The subsoil extends to a depth of 35 inches. It is light yellowish brown slaty loam. The substratum is light yellowish brown very slaty loam. Hard slate bedrock is at a depth of 46 inches.

Included with this soil in mapping are small intermingled areas of the Cataska, Clymer, Dekalb, and Whiteford soils. The Clymer, Dekalb, and Whiteford soils are similar in location to the Cardiff soils. The Cataska soils are steeper. Also included are small areas of wetter soils in depressions and along drainageways and soils on foot slopes and along drainageways that have a thicker subsoil and contain fewer coarse fragments than the Cardiff soil. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Cardiff soil is moderate, and the available water capacity is low. Surface runoff is medium. The erosion hazard is moderate. The surface layer and subsoil have a high content of slate and phyllite fragments. The subsoil has a low shrink-swell potential. The thickness of the root zone and depth to bedrock are 40 to 60 inches. The Cardiff soil is low in organic matter content and natural fertility. It is very strongly acid or strongly acid unless lime has been applied.

Areas of this soil are about equally divided between pasture and woodland. A few areas are used for cultivated crops.

This Cardiff soil is moderately well suited to cultivated crops. The low available water capacity, acidity, and low natural fertility limit crop production. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is only fair because of the high content of coarse fragments in the surface layer. Crop yields can be increased by applying lime and fertilizer if rainfall is adequate throughout the growing season.

This soil is poorly suited to fruits, nuts, and berries. The major limitations are low available water capacity, shallow rooting depth, acidity, and low natural fertility. The low available water capacity, especially, reduces the size of fruit and limits development of fruit buds.

This soil is moderately well suited to pasture and hay grasses. Limitations are the low available water capacity, acidity, and low natural fertility. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Cardiff soil for trees is moderately high. Seedling survival is limited by the low available water capacity.

Depth to bedrock limits the use of this soil for septic tank absorption fields, trench type sanitary landfills, and dwellings with basements. Seepage limits its use for sewage lagoons and pond reservoirs. The high content of coarse fragments limits its use for landfill cover, topsoil, and most types of recreation. Frost action limits the use of this soil for roads and streets.

This Cardiff soil is in capability subclass IIe.

6C—Cardiff slaty loam, 8 to 15 percent slopes. This rolling soil is deep and well drained. It is on narrow side slopes in the foothills of the Blue Ridge Mountains. Slopes are rough and complex and about 100 to 400 feet long. Areas of this soil are long and winding and range from about 5 to 30 acres.

Typically, the surface layer of this Cardiff soil is very dark gray slaty loam 1 inch thick, and the subsurface layer is pale brown slaty loam to a depth of 5 inches. The subsoil extends to a depth of 32 inches. It is light yellowish brown slaty loam. The substratum is light yellowish brown very slaty loam. Hard slate bedrock is at a depth of 42 inches.

Included with this soil in mapping are small intermingled areas of the Cataska, Clymer, Dekalb, and Whiteford soils. The Cataska soils are on steeper side slopes. The Clymer, Dekalb, and Whiteford soils are similar in location to the Cardiff soils. Also included are areas of wetter soils in depressions and along drainageways and soils on foot slopes and along drainageways that have a thicker subsoil and fewer coarse fragements than this Cardiff soil. Areas of the included soils make up about 25 percent of this map unit.

The permeability of this Cardiff soil is moderate, and the available water capacity is low. Surface runoff is rapid. The erosion hazard is severe. The surface layer and subsoil have a high content of slate and phyllite fragments. The subsoil has a low shrink-swell potential. The thickness of the root zone and depth to bedrock are 40 to 60 inches. This Cardiff soil is low in organic matter content and natural fertility. It is very strongly acid or strongly acid unless lime has been applied.

Areas of this soil are about equally divided between pasture and woodland. A few areas are used for cultivated crops.

This Cardiff soil is poorly suited to cultivated crops. The low available water capacity, acidity, and low natural fertility limit crop production. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is only fair because of the high content of coarse fragments in the surface layer. Crop yields can be increased by applying lime and fertilizer if rainfall is adequate throughout the growing season.

This soil is poorly suited to fruits, nuts, and berries. The major limitations are the low available water

capacity, shallow rooting depth, acidity, and low natural fertility. The low available water capacity, especially, reduces the size of fruit and limits development of fruit buds.

This soil is moderately well suited to pasture and hay grasses. Limitations are the low available water capacity, acidity, and low natural fertility. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Cardiff soil for trees is moderately high. Seedling survival is limited by the low available water capacity.

Depth to bedrock and slope limit the use of this soil for septic tank absorption fields, trench type sanitary landfills, small commercial buildings, and dwellings. Seepage limits the use of this soil for sewage lagoons and pond reservoirs. The high content of coarse fragments and slope limit its use for landfill cover, topsoil, and most types of recreation. Frost action limits the use of this soil for roads and streets.

This Cardiff soil is in capability subclass IIIe.

7D—Cataska-Cardiff slaty loams, 15 to 45 percent slopes. This moderately steep to very steep complex consists of shallow, excessively drained Cataska soils and deep, well drained Cardiff soils. This map unit is on narrow side slopes in the foothills of the Blue Ridge Mountains, and the soils are so intermingled that it was not practical to map them separately. The unit is about 45 percent Cataska soils, 35 percent Cardiff soils, and 20 percent other soils. Slopes are smooth and about 100 to 450 feet long. Areas of these soils are long and winding and range from about 5 to 50 acres.

Typically, the surface layer of the Cataska soil is very dark grayish brown slaty loam 1 inch thick, and the subsurface layer is yellowish brown slaty loam to a depth of 3 inches. The subsoil is yellowish brown slaty loam 10 inches thick. The substratum is about 80 percent slate and about 20 percent yellowish brown loam. Hard slate bedrock is at a depth of 21 inches.

Typically, the surface layer of the Cardiff soil is very dark gray slaty loam 1 inch thick, and the subsurface layer is pale brown slaty loam to a depth of 5 inches. The subsoil extends to a depth of 32 inches. It is light yellowish brown very slaty loam. The substratum is light yellowish brown very slaty loam. Hard slate bedrock is at a depth of 42 inches.

Included with these soils in mapping are small intermingled areas of the Braddock, Clymer, Dekalb, Laidig, and Whiteford soils. The Braddock, Clymer, and Whiteford soils are on small included ridges. The Dekalb soils are similar in location to the Cataska and Cardiff soils. The Laidig soils are in slight depressions and at the heads of drainageways. Also included are wetter soils in depressions and along drainageways. Rock outcrops are in many areas.

The permeability of both soils is moderate. The available water capacity is very low in the Cataska soils and low in the Cardiff soils. Surface runoff is very rapid. The erosion hazard is severe. The surface layer and subsoil of both soils have a high content of slate fragments. The subsoil of both soils has a low shrink-swell potential. The thickness of the root zone and depth to bedrock are 20 to 40 inches in the Cataska soils and 40 to 60 inches in the Cardiff soils. The Cataska and Cardiff soils have low natural fertility and organic matter content. Both soils are very strongly acid or strongly acid.

Most areas of this complex are in woodland. A small acreage is used for pasture.

This Cataska-Cardiff complex is not suited to cultivated crops or to fruits, nuts, and berries because slope restricts the use of machinery. Also, the soils have very low or low available water capacity, acidity, and low natural fertility. The low available water capacity reduces the size of fruit and limits development of fruit buds.

This complex is moderately well suited to pasture; however, slope limits the use of machinery. Other soil limitations are the very low and low available water capacity, the acidity, and the low natural fertility. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Cataska soils for trees is low, and that of the Cardiff soils is moderately high. Seedling survival is limited by the low available water capacity of both soils. Also, root development is limited on Cataska soils by the shallow depth to bedrock and the high slate content. Slope limits the use of heavy equipment on this complex. Placing skid trails on the contour reduces the erosion hazard.

Slope and depth to bedrock limit the use of this complex for septic tank absorption fields, sanitary landfills, shallow excavations, dwellings, small commercial buildings, and roads and streets. They also limit most types of recreation.

This Cataska-Cardiff complex is in capability subclass VIIs.

8D—Catoctin-Myersville complex, 15 to 45 percent slopes. This moderately steep to very steep complex consists of moderately deep, well drained Catoctin soils and deep, well drained Myersville soils. These soils are on side slopes in the Blue Ridge Mountains. They are so intermingled that it was not practical to map them separately. This map unit is about 45 percent Catoctin soils, 30 percent Myersville soils, and 25 percent other soils. Slopes are smooth and about 200 to 600 feet long.

Areas of this complex are long and winding and range from about 5 to 50 acres.

Typically, the surface layer of the Catoctin soil is brown cobbly silt loam about 6 inches thick. The subsoil extends to a depth of 20 inches. It is yellowish brown channery silt loam in the upper part and strong brown channery silt loam interrupted by lenses and pockets of silty clay loam in the lower part. The substratum is mottled yellowish brown very channery silt loam. Hard greenstone bedrock is at a depth of 29 inches.

Typically, the surface layer of the Myersville soil is dark reddish brown channery silt loam about 7 inches thick. The subsoil extends to a depth of 38 inches. It is reddish brown and yellowish red channery clay loam. The substratum is yellowish red very channery clay loam to a depth of at least 62 inches.

Included with these soils in mapping are small intermingled areas of the Dekalb, Laidig, and Lew soils. The Dekalb soils are similar in location to the Catoctin and Myersville soils. The Laidig and Lew soils are on concave foot slopes and in the heads of drainageways. Also included are areas that are steeper, areas that have rock outcrops, and areas that have stones more than 10 inches in diameter covering roughly 3 to 15 percent of the surface.

The permeability is moderately rapid in the Catoctin soils and moderate in the Myersville soils. The available water capacity is low in the Catoctin soils and moderate in the Myersville soils. Surface runoff is rapid. The erosion hazard is severe. The surface layer and subsoil of both soils have a high content of rock fragments. The subsoil of both soils has a low shrink-swell potential. The thickness of the root zone and depth to bedrock are 20 to 40 inches in the Catoctin soils and more than 60 inches in the Myersville soils. Both soils are medium in natural fertility. The organic matter content is moderate in the Catoctin soils and low in the Myersville soils. Both soils generally are strongly or medium acid unless lime has been applied.

Most areas of this complex are in woodland. A small acreage is in pasture.

This Catoctin-Myersville complex is not suited to cultivated crops and is moderately well suited to fruits, nuts, and berries. Slope restricts the use of machinery. Also, the Catoctin soils have low available water capacity and a high content of coarse fragments. The low available water capacity reduces the size of fruit and limits the development of fruit buds.

This complex is moderately well suited to pasture; however, slope limits the use of machinery. Other limitations are low available water capacity, acidity, and the large number of coarse fragments on the surface. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of Catoctin soils for trees is moderate, and that of the Myersville soils is very high. Seedling survival is limited by the low available water capacity and depth to bedrock of the Catoctin soils. Slope limits the use of heavy equipment on this complex. Placing skid trails on the contour reduces the erosion hazard.

Slope, the high content of coarse fragments on the surface, and the depth to bedrock of the Catoctin soils limit the use of this complex for septic tank absorption fields, sewage lagoons, shallow excavations, dwellings, small commercial buildings, roads and streets, and most types of recreation.

This Catoctin-Myersville complex is in capability subclass VIIe.

9D—Catoctin-Myersville very stony silt loams, 15 to 45 percent slopes. This complex consists of moderately deep Catoctin soils and deep Myersville soils. These soils are moderately steep to very steep and well drained and are on side slopes in the Blue Ridge Mountains. These soils are so intermingled that it was not practical to map them separately. This map unit is about 45 percent Catoctin soils, 30 percent Myersville soils, and 25 percent other soils. Slopes are smooth and about 200 to 600 feet long. Areas of this complex are long and winding and range from about 5 to 50 acres. Stones more than 10 inches in diameter cover roughly 3 to 15 percent of the surface.

Typically, the surface layer of the Catoctin soil is brown cobbly silt loam about 6 inches thick. The subsoil extends to a depth of 20 inches. It is yellowish brown channery silt loam in the upper part and strong brown channery silt loam interrupted by lenses and pockets of silty clay loam in the lower part. The substratum is mottled yellowish brown very channery silt loam. Hard greenstone bedrock is at a depth of 29 inches.

Typically, the surface layer of the Myersville soil is dark reddish brown channery silt loam about 7 inches thick. The subsoil extends to a depth of 38 inches. It is reddish brown and yellowish red channery clay loam. The substratum is yellowish red very channery clay loam to a depth of at least 62 inches.

Included with these soils in mapping are small intermingled areas of the Dekalb, Laidig, and Lew soils. The Dekalb soils are similar in location to the Catoctin and Myersville soils. The Laidig and Lew soils are on concave foot slopes and in the heads of drainageways. Also included are areas where slopes are steeper and areas that have rock outcrops.

Permeability is moderately rapid in the Catoctin soils and moderate in the Myersville soils. The available water capacity is low in the Catoctin soils and moderate in the Myersville soils. Surface runoff is very rapid. The erosion hazard is severe. The surface layer and subsoil of both soils have a high content of rock fragments. The subsoil of both soils has a low shrink-swell potential. The thickness of the root zone and depth to bedrock are 20

to 40 inches in the Catoctin soils and more than 60 inches in the Myersville soils. Both soils are medium in natural fertility. The organic matter content is moderate in the Catoctin soils and low in the Myersville soils. Both soils generally are strongly acid or medium acid unless lime has been applied.

Most areas of this complex are in woodland. A small acreage is in pasture.

This Catoctin-Myersville complex is not suited to cultivated crops and is moderately well suited to fruits, nuts, and berries. Slope and large stones restrict the use of machinery. Also, the Catoctin soils have low available water capacity and a high content of coarse fragments. The low available water capacity reduces the size of fruit and limits the development of fruit buds.

This complex is moderately well suited to pasture; however, slope and large stones limit the use of most machinery except light machinery and hand tools. Other limitations are the low available water capacity, acidity, and the large number of coarse fragments on the surface. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Catoctin soils for trees is moderate, and that of the Myersville soils is very high. Seedling survival is limited by the available water capacity and depth to bedrock of the Catoctin soils. Slope limits the use of heavy equipment on this complex. Placing skid trails on the contour reduces the erosion hazard.

Slope, large stones on the surface, the high content of coarse fragments, and the depth to bedrock of the Catoctin soils limit the use of this complex for septic tank absorption fields, sewage lagoons, shallow excavations, dwellings, small commercial buildings, and roads and streets. They also limit most types of recreation.

This Catoctin-Myersville complex is in capability subclass VIIs.

10—Chagrin soils. These soils are deep, nearly level, and well drained. They are on moderately broad flood plains of major streams in the Shenandoah Valley and are characterized by convex levees and concave scour channels. Surface textures are highly variable and are mainly fine sandy loam, sandy loam, loam, or silt loam along the Shenandoah River and silt loam along Opequon Creek. Areas of these soils are long and winding and range from about 5 to 60 acres. Slopes range from 0 to 3 percent and are complex.

Typically, the surface layer of these Chagrin soils is brown fine sandy loam about 9 inches thick. The subsoil extends to a depth of 42 inches. It is brown fine sandy loam and loam. The substratum is brown loam to a depth of at least 72 inches.

Included with these soils in mapping are small intermingled areas of the Buckton, Lobdell, and Weaver soils and Udipsamments. The Buckton soils are similar in location to the Chagrin soils. The Lobdell and Weaver soils are in slight depressions, scour channels, and slack-water areas adjacent to the escarpment. The Udipsamments are on levees adjacent to the streams. Areas of the included soils make up about 20 percent of this map unit.

The permeability of these Chagrin soils is moderate, and the available water capacity is moderate. Surface runoff is slow. These Chagrin soils have an apparent seasonal high water table at a depth of 4 to 6 feet during February and March. These soils are occasionally flooded for brief periods from November through May. The erosion hazard is slight. The surface layer is friable and easily tilled. These soils have a low shrink-swell potential. The thickness of the root zone and depth to bedrock are more than 60 inches. These soils have high natural fertility and moderate organic matter content. They are slightly acid or neutral.

These soils are well suited to cultivated crops, and most of the acreage is farmed. Flooding occasionally damages crops and limits the use of machinery. Tilth is good. Crop yields can be increased by applying fertilizer, but lime is not needed. Conservation tillage conserves moisture and reduces erosion. Row crops can be grown continuously on these soils.

These soils are poorly suited to fruits, nuts, and berries, mainly because poor air drainage causes freezing of fruit buds. Flooding limits the use of machinery for spraying and weed control.

These soils are well suited to pasture and hay grasses. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying fertilizer increase the productivity and carrying capacity of pastures.

The potential of these Chagrin soils for trees is very high; however, most areas are farmed. Occasional flooding limits the use of equipment in managing and harvesting timber.

Flooding is the major limitation to use of these soils for septic tank absorption fields, sanitary facilities, shallow excavations, dwellings, and small commercial buildings. It is also a limitation for camp areas and playgrounds.

These Chagrin soils are in capability subclass IIw.

11B—Clymer channery loam, 3 to 15 percent slopes. This gently sloping to sloping soil is deep and well drained. It is on narrow ridges in the foothills of the Blue Ridge Mountains. Slopes are smooth and about 200 to 500 feet long. Areas of this soil are long and winding and range from about 5 to 30 acres.

Typically, the surface layer of this Clymer soil is very dark gray channery loam about 2 inches thick. The subsurface layer is yellowish brown channery loam 8

inches thick. The subsoil extends to a depth of 30 inches. It is strong brown clay loam in the upper part and strong brown channery clay loam in the lower part. The substratum extends to a depth of at least 62 inches. It is yellowish brown very channery sandy loam mottled with strong brown and yellowish red.

Included with this soil in mapping are small intermingled areas of the Cardiff, Dekalb, Hazleton, Laidig, and Whiteford soils. The Cardiff, Dekalb, Hazleton, and Whiteford soils are similar in location to the Clymer soils. The Laidig soils are in saddles, depressions, and heads of drainageways. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Clymer soil is moderate, and the available water capacity is low. Surface runoff is medium to rapid. The erosion hazard is severe. The surface layer is very friable but has a high content of coarse fragments. The subsoil has a low shrink-swell potential. The root zone extends to a depth of more than 40 inches but is somewhat restricted below 30 inches by a high content of coarse fragments. Depth to bedrock ranges from 40 to 60 inches or more. The soil is moderate in organic matter content and low in natural fertility. The soil ranges from extremely acid through strongly acid unless lime has been applied.

Most areas of this soil are in woodland. A small acreage is used for cultivated crops or pasture.

This Clymer soil is moderately well suited to cultivated crops. Tilth is only fair because a high content of coarse fragments interferes with tillage and seedbed preparation. Crop yields can be increased by applying lime and fertilizer. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture.

This soil is moderately well suited to fruits, nuts, and berries. The major limitations are the acidity, low available water capacity, and low natural fertility. The low available water capacity reduces the size of fruit and affects development of fruit buds. Crop yields can be increased by applying lime and fertilizer.

This soil is moderately well suited to pasture and to hay grasses and legumes. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Clymer soil for trees is high. Seedlings survive and grow well if competing vegetation is controlled.

Slope and depth to bedrock limit the use of this soil for septic tank absorption fields, sewage lagoons, shallow excavations, dwellings, sanitary landfills, and small commercial buildings. Frost action limits its use for roads and streets. Small stones limit its use as a source of topsoil and for playgrounds.

This Clymer soil is in capability subclass IIIe.

12D—Dekalb channery sandy loam, 15 to 30 percent slopes. This hilly soil is moderately deep and well drained. It is on side slopes in the foothills of the Blue Ridge Mountains. Slopes are rough and complex and about 200 to 1,000 feet long. Areas of this soil are long and winding and range from about 15 to 100 acres.

Typically, the surface layer of this Dekalb soil is black channery sandy loam about 2 inches thick. The subsurface layer is light yellowish brown channery sandy loam 6 inches thick. The subsoil is yellowish brown channery sandy loam to a depth of 31 inches. The substratum is yellowish brown very flaggy sandy loam. Hard sandstone bedrock is at a depth of 39 inches.

Included with this soil in mapping are small intermingled areas of the Clymer, Hazleton, and Laidig soils. The Clymer and Hazleton soils are on small, less sloping ridges. The Laidig soils are in saddles and depressions, in heads of drainageways, and on toe slopes. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Dekalb soil is moderately rapid, and the available water capacity is very low. Surface runoff is very rapid. The erosion hazard is severe. The surface layer is very friable but has a high content of coarse fragments. The subsoil has a low shrink-swell potential. The thickness of the root zone and depth to hard sandstone and quartzite bedrock range from 20 to 40 inches. The soil has low natural fertility and organic matter content. It ranges from extremely acid through strongly acid unless lime has been applied.

Most areas of this soil are in woodland. A few small areas are used for pasture.

This Dekalb soil is not suited to cultivated crops and is poorly suited to fruits, nuts, and berries. Slope and the high content of coarse fragments in the surface layer severely restrict the use of machinery and tillage equipment. Also, the soil has very low available water capacity, an acid reaction, and low natural fertility. The very low available water capacity reduces the size of fruit and affects the development of fruit buds.

This soil is poorly suited to pasture because slope and coarse fragments severely restrict the use of machinery and tillage equipment. The very low available water capacity, acidity, and low natural fertility also restrict the establishment and maintenance of grasses and legumes on this soil. Applying lime and fertilizer, rotating pastures, and deferring grazing increase the productivity and carrying capacity of pastures.

The potential for trees is moderate on north-facing slopes and low on south-facing slopes. Seedling survival and growth are limited by the very low available water capacity, acidity, and low natural fertility. Slope restricts the use of heavy timber equipment on this soil. Placing skid trails on the contour reduces the erosion hazard.

Slope, shallow depth to bedrock, and high content of coarse fragments severely limit the use of this soil for septic tank absorption fields, sanitary landfills, shallow excavations, dwellings, small commercial buildings, and roads and streets. These limitations also affect most types of recreation.

This Dekalb soil is in capability subclass VIe.

12E—Dekalb channery sandy loam, 30 to 50 percent slopes. This very steep soil is moderately deep and well drained. It is on side slopes in the foothills of the Blue Ridge Mountains. Slopes are rough and complex and about 200 to 1,000 feet long. Areas of this soil are long and winding and range from about 15 to 100 acres.

Typically, the surface layer of this Dekalb soil is black channery sandy loam about 2 inches thick. The subsurface layer is light yellowish brown channery sandy loam 4 inches thick. The subsoil is yellowish brown channery sandy loam to a depth of 26 inches. The substratum is yellowish brown very flaggy sandy loam. Hard sandstone bedrock is at a depth of 32 inches.

Included with this soil in mapping are small intermingled areas of the Clymer, Hazleton, and Laidig soils. The Clymer and Hazleton soils are on small, less sloping ridges. The Laidig soils are in saddles and depressions, in heads of drainageways, and on toe slopes. Areas of the included soils make up about 15 percent of this map unit.

The permeability of this Dekalb soil is moderately rapid, and the available water capacity is very low. Surface runoff is very rapid. The erosion hazard is severe. The surface layer is very friable but has a high content of coarse fragments. The subsoil has a low shrink-swell potential. The thickness of the root zone and depth to hard sandstone and quartzite bedrock range from 20 to 40 inches. This soil has low natural fertility and organic matter content. It ranges from extremely acid through strongly acid unless lime has been applied.

Areas of this Dekalb soil are mainly in woodland. The potential for trees is low on south-facing slopes and moderate on north-facing slopes. Seedling survival and growth are limited by the very low available water capacity, acidity, and low natural fertility. Slope severely restricts the use of heavy timber equipment.

The very steep slopes generally make this soil unsuitable for farming, community development, or recreation.

This Dekalb soil is in capability subclass VIIe.

13D—Dekalb very stony sandy loam, 8 to 30 percent slopes. This rolling to steep soil is moderately deep and well drained. It is on ridges and side slopes in the foothills of the Blue Ridge Mountains. Slopes are rough and complex and about 200 to 800 feet long. Areas of this soil are long and winding and range from about 15 to 80 acres. Stones larger than 15 inches in diameter cover roughly 3 to 15 percent of the surface.

Typically, the surface layer of this Dekalb soil is black flaggy sandy loam about 2 inches thick. The subsurface layer is light yellowish brown channery sandy loam 6 inches thick. The subsoil is yellowish brown channery sandy loam to a depth of 31 inches. The substratum is yellowish brown very flaggy sandy loam. Hard sandstone bedrock is at a depth of 39 inches.

Included with this soil in mapping are small intermingled areas of the Clymer, Hazleton, and Laidig soils. The Clymer and Hazleton soils are on small, less sloping ridges. The Laidig soils are in saddles and depressions, in heads of drainageways, and on toe slopes. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Dekalb soil is moderately rapid, and the available water capacity is very low. Surface runoff is very rapid. The erosion hazard is severe. The surface layer is very friable but has a high content of coarse fragments. The subsoil has a low shrink-swell potential. The thickness of the root zone and depth to hard sandstone and quartzite bedrock range from 20 to 40 inches. This soil has low natural fertility and organic matter content. It ranges from extremely acid through strongly acid unless lime has been applied.

Most areas of this soil are in woodland. A few small areas are used for pasture.

This Dekalb soil is not suited to cultivated crops and is poorly suited to fruits, nuts, and berries. Slope, the high content of coarse fragments, and large stones on the surface severely restrict the use of machinery and tillage equipment. Also, this soil has very low available water capacity, an acid reaction, and low natural fertility. The very low available water capacity reduces the size of fruit and affects the development of fruit buds.

This Dekalb soil is poorly suited to pasture because slope and coarse fragments and large stones on the surface severely restrict the use of machinery and tillage equipment. The very low available water capacity, acidity, and low natural fertility restrict the establishment and maintenance of grasses and legumes. Applying lime and fertilizer, rotating pastures, and deferring grazing increase the productivity and carrying capacity of pastures.

The potential for trees is moderate on north-facing slopes and low on south-facing slopes. Seedling survival and growth are limited by the very low available water capacity, acidity, and low natural fertility of this soil. Slope restricts the use of heavy timber equipment. Placing skid trails on the contour reduces the erosion hazard.

Slope, shallow depth to bedrock, and high content of coarse fragments and large stones severely limit the use of this soil for septic tank absorption fields, sanitary landfills, shallow excavations, dwellings, small

commercial buildings, and roads and streets. These limitations also affect most types of recreation.

This Dekalb soil is in capability subclass VIs.

13E—Dekalb very stony sandy loam, 30 to 50 percent slopes. This very steep soil is moderately deep and well drained. It is on side slopes in the foothills of the Blue Ridge Mountains. Slopes are rough and complex and about 300 to 1,500 feet long. Areas of this soil are long and winding and range from about 5 to 100 acres. Stones larger than 15 inches in diameter cover roughly 3 to 15 percent of the surface.

Typically, the surface layer of this Dekalb soil is black channery sandy loam about 2 inches thick. The subsurface layer is light yellowish brown channery sandy loam 4 inches thick. The subsoil is yellowish brown channery sandy loam to a depth of 26 inches. The substratum is yellowish brown very flaggy sandy loam. Hard sandstone bedrock is at a depth of 32 inches.

Included with this soil in mapping are small intermingled areas of the Clymer, Hazleton, and Laidig soils. The Clymer and Hazleton soils are on small, less sloping ridges. The Laidig soils are in saddles and depressions, in heads of drainageways, and on toe slopes. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Dekalb soil is moderately rapid, and the available water capacity is very low. Surface runoff is very rapid. The erosion hazard is severe. The surface layer is very friable but has a high content of coarse fragments. The subsoil has a low shrink-swell potential. The thickness of the root zone and depth to hard sandstone and quartzite bedrock range from 20 to 40 inches. The soil has low natural fertility and organic matter content. It ranges from extremely acid through strongly acid.

Areas of this Dekalb soil are mostly in woodland. The potential for trees is low on south-facing slopes and moderate on north-facing slopes. Seedling survival and growth are limited by the very low available water capacity, acidity, and low natural fertility. Slope severely restricts the use of heavy timber equipment.

The very steep slopes and large stones generally make this soil unsuitable for farming, community development, or recreation.

This Dekalb soil is in capability subclass VIIs.

14C—Dekalb-Hazleton channery sandy loams, 3 to 15 percent slopes. This complex consists of moderately deep Dekalb soils and deep Hazleton soils. They are undulating to rolling and well drained and are on ridges in the foothills of the Blue Ridge Mountains. These soils are so intermingled that it was not practical to map them separately. This complex is about 45 percent Dekalb soils, 35 percent Hazleton soils, and 20 percent other soils. Slopes are rough and complex and about 200 to 600 feet long. Areas of this complex are long and winding and range from about 5 to 75 acres.

Typically, the surface layer of the Dekalb soil is black channery sandy loam about 2 inches thick. The subsurface layer is light yellowish brown channery sandy loam 6 inches thick. The subsoil is yellowish brown channery sandy loam to a depth of 31 inches. The substratum is yellowish brown very flaggy sandy loam. Hard sandstone bedrock is at a depth of 39 inches.

Typically, the surface layer of the Hazleton soil is very dark grayish brown channery sandy loam 1 inch thick. The subsurface layer is yellowish brown channery sandy loam 7 inches thick. The subsoil extends to a depth of 35 inches. It is mostly yellowish brown channery sandy loam with very channery sandy loam in the lower part. The substratum extends to a depth of at least 60 inches. It is pale brown very channery sandy loam in the upper 5 inches and light yellowish brown very channery sandy loam in the lower part.

Included with these soils in mapping are small intermingled areas of the Clymer, Laidig, and Whiteford soils. The Clymer and Whiteford soils are similar in location to the Dekalb and Hazleton soils. The Laidig soils are in saddles and depressions, in heads of drainageways, and on toe slopes.

The permeability is moderately rapid and the available water capacity is very low in both the Dekalb and Hazleton soils. Surface runoff is rapid. The erosion hazard is severe. The surface layer of both soils is friable but has a high content of coarse fragments. The subsoil of both soils has a low shrink-swell potential. The thickness of the root zone and depth to hard sandstone bedrock range from 20 to 40 inches in the Dekalb soils and from 40 to 72 inches or more in the Hazleton soils. Both soils have low natural fertility and organic matter content. The soils range from extremely acid through strongly acid unless lime has been applied.

Most areas of this complex are in woodland. A few small areas are used for cultivated crops or pasture.

This Dekalb-Hazleton complex is poorly suited to cultivated crops and to fruits, nuts, and berries. Productivity is limited by the very low available water capacity, acidity, and low natural fertility of the soils. Tillage operations are limited by the high content of coarse fragments. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, conserve moisture, and help control erosion. Crop yields can be increased by applying lime and fertilizer.

These soils are moderately well suited to pasture. Coarse fragments restrict tillage, however, and the very low available water capacity and low natural fertility restrict the establishment and maintenance of grasses and legumes. Applying lime and fertilizer, rotating pastures, and deferring grazing increase the productivity and carrying capacity of pastures.

The potential of the Dekalb soils for trees is moderate, and that of the Hazleton soils is moderately high. Seedling survival and growth are limited by the available water capacity and low fertility, especially of the Dekalb soils.

Slope, shallow depth to bedrock, seepage, and the high content of coarse fragments severely limit the use of this complex for septic tank absorption fields, sanitary landfills, shallow excavations, dwellings, small commercial buildings, and roads and streets. They are also limitations for most types of recreation.

This Dekalb-Hazleton complex is in capability subclass IIIe.

15B—Endcav-Dandridge complex, 3 to 8 percent slopes. This gently sloping complex consists of deep and well drained Endcav soils and shallow and excessively drained Dandridge soils. These soils are on moderately broad ridges in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. This complex is about 45 percent Endcav soils, 35 percent Dandridge soils, and 20 percent other soils. Slopes are smooth and about 200 to 1,200 feet long. Areas of this complex are long and winding and range from about 5 to 150 acres.

Typically, the surface layer of the Endcav soil is dark yellowish brown silty clay loam about 10 inches thick. The subsoil extends to a depth of 42 inches. It is yellowish brown silty clay loam and clay. The substratum is yellowish brown shaly and very shaly silty clay. Hard stratified shale and limestone are at a depth of 64 inches.

Typically, the surface layer of the Dandridge soil is dark yellowish brown shaly silty clay loam about 5 inches thick. The subsoil is strong brown shaly silty clay loam 8 inches thick. The substratum is mottled strong brown, yellowish brown, and light olive brown very shaly clay. Rippable, calcareous shale bedrock is at a depth of 17 inches.

Included with these soils in mapping are small intermingled areas of the Berks, Berks Variant, Duffield, Nicholson, Timberville, and Weikert soils. The Berks, Berks Variant, Duffield, and Nicholson soils are similar in location to the Endcav and Dandridge soils. The Timberville soils are in depressions, in heads of drainageways, and on foot slopes. The Weikert soils are in steeper areas. Also included are scattered outcrops of shale and limestone bedrock that are generally more than 300 feet apart and severely eroded areas that have a silty clay or clay surface layer.

The permeability is slow in the Endcav soils and moderately slow in the Dandridge soils. The available water capacity is moderate in the Endcav soils and very low in the Dandridge soils. Surface runoff is medium. The erosion hazard is moderate. The surface layer of both soils is friable, but the Dandridge soils have a high content of coarse fragments. The subsoil of the Endcav soils has a high shrink-swell potential, and that of the Dandridge soils has a moderate shrink-swell potential. The thickness of the root zone and depth to bedrock are 40 to 72 inches in the Endcav soils and 6 to 20 inches in the Dandridge soils.

Both soils have high natural fertility and low organic matter content. In the Endcav soils the surface layer and upper part of the subsoil range from strongly acid through neutral, and the lower part of the subsoil and the substratum range from slightly acid through moderately alkaline. The Dandridge soils are slightly acid through mildly alkaline.

Most areas of this complex are used for pasture or orchards. A small acreage is cultivated, and the remainder is in woodland.

This Endcav-Dandridge complex is moderately well suited to cultivated crops. The major limitations are the shallow rooting depth and very low available water capacity in the Dandridge soils. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is fair and can be maintained by incorporating organic matter into the surface layer and by plowing at optimum moisture content. Crop yields can be increased by fertilizing, but liming is generally not needed.

This complex is moderately well suited to fruits, nuts, and berries. The major limitations are the shallow rooting depth and very low available water capacity in the Dandridge soils. The very low available water capacity reduces the size of fruit and affects development of fruit buds.

This complex is moderately well suited to pasture. The major limitation is the very low available water capacity in the Dandridge soils. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Endcav soils for trees is high, and that of the Dandridge soils is moderate. Seedling survival and growth are severely limited on the Dandridge soils by the shallow rooting depth and very low available water capacity.

The high shrink-swell potential, high clay content, low soil strength, and slow permeability in the Endcav soils and the shallow depth to bedrock in the Dandridge soils are the main limitations for the use of this complex for septic tank absorption fields, sanitary landfills, shallow excavations, dwellings, small commercial buildings, and roads and streets. These are also limitations for most types of recreation.

This Endcav-Dandridge complex is in capability subclass IIIe.

15C—Endcav-Dandridge complex, 8 to 15 percent slopes. This rolling complex consists of deep, well drained Endcav soils and shallow, excessively drained

Dandridge soils. These soils are on narrow side slopes in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. The complex is about 45 percent Endcav soils, 35 percent Dandridge soils, and 20 percent other soils. Slopes are complex and about 200 to 400 feet long. Areas of this complex are long and winding and range from about 5 to 30 acres.

Typically, the surface layer of the Endcav soil is dark yellowish brown silty clay loam about 8 inches thick. The subsoil extends to a depth of 35 inches. It is yellowish brown silty clay loam and clay. The substratum is yellowish brown shaly and very shaly silty clay. Hard stratified shale and limestone are at a depth of 48 inches.

Typically, the surface layer of the Dandridge soil is dark yellowish brown shaly silty clay loam about 4 inches thick. The subsoil is strong brown shaly silty clay loam and silty clay 6 inches thick. The substratum is mottled strong brown, yellowish brown, and light olive brown very shaly clay. Rippable, calcareous shale bedrock is at a depth of 14 inches.

Included with these soils in mapping are small intermingled areas of the Berks, Berks Variant, Duffield, Nicholson, Timberville, and Weikert soils. The Berks, Berks Variant, Duffield, and Nicholson soils are similar in location to the Endcav and Dandridge soils. The Timberville soils are in depressions, in heads of drainageways, and on foot slopes. The Weikert soils are on steeper areas. Also included in mapping are scattered outcrops of shale and limestone bedrock that are generally more than 300 feet apart and severely eroded areas that have a silty clay or clay surface layer.

The permeability is slow in the Endcav soils and moderately slow in the Dandridge soils. The available water capacity is moderate in the Endcav soils and very low in the Dandridge soils. Surface runoff is rapid. The erosion hazard is severe. The surface layer of both soils is friable, but Dandridge soils have a high content of coarse fragments. The subsoil of the Endcav soils has a high shrink-swell potential, and that of the Dandridge soils is moderate. The thickness of the root zone and depth to bedrock are 40 to 72 inches in the Endcav soils and 6 to 20 inches in the Dandridge soils.

Both soils are high in natural fertility and low in organic matter content. In the Endcav soils the surface layer and upper part of the subsoil range from strongly acid through neutral, and the lower part of the subsoil and the substratum range from slightly acid through moderately alkaline. The Dandridge soils are slightly acid through mildly alkaline.

Most areas of this complex are used for pasture or orchards. A small acreage is cultivated, and the remainder is in woodland.

This Endcav-Dandridge complex is moderately well suited to cultivated crops. The major limitations are the shallow rooting depth and very low available water capacity of the Dandridge soils. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is fair and can be maintained by incorporating organic matter into the surface layer and by plowing at optimum moisture content. Crop yields can be increased by fertilizing, but liming is generally not needed.

This complex is moderately well suited to fruits, nuts, and berries. The major limitations are the shallow rooting depth and very low available water capacity of the Dandridge soils. The very low available water capacity reduces the size of fruit and affects development of fruit buds.

This complex is moderately well suited to pasture. The major limitation is the very low available water capacity of the Dandridge soils. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Endcav soils for trees is high, and that of the Dandridge soils is moderate. Seedling survival and growth are severely limited on the Dandridge soils by the shallow rooting depth and very low available water capacity.

The slope, high shrink-swell potential, high clay content, low strength, and slow permeability of the Endcav soils and the shallow depth to bedrock of the Dandridge soils are the main limitations for use of this complex for septic tank absorption fields, sanitary landfills, shallow excavations, dwellings, small commercial buildings, and roads and streets. These are also limitations for most types of recreation.

This Endcav-Dandridge complex is in capability subclass IVe.

16B—Fluvaquents, 0 to 8 percent slopes. This nearly level to gently sloping map unit mainly consists of moderately deep and deep, poorly drained and somewhat poorly drained, loamy soils. These soils are on narrow flood plains and colluvial foot slopes in the foothills of the Blue Ridge Mountains. Slopes are smooth and about 100 to 400 feet long. Areas of these soils are long and winding and range from about 5 to 30 acres.

Included with this unit in mapping are small intermingled areas of the Cardiff and Laidig soils and Udorthents, extremely stony. The Cardiff and Laidig soils have steeper slopes. The Udorthents, extremely stony, are similar in location to the Fluvaquents. Areas of included soils make up about 25 percent of this unit.

The permeability and available water capacity are variable for soils of this map unit. Surface runoff is slow to medium, and in some areas water is ponded. The erosion hazard is slight. The thickness of the root zone and depth to bedrock are 30 to 72 inches or more. The surface layer and subsoil are strongly acid or medium

acid unless lime has been applied. These soils are frequently flooded for brief periods.

Most areas of this map unit are in woodland. A small acreage is used for pasture. Flooding and wetness generally limit uses of these soils other than for wildlife habitat and natural areas.

These Fluvaquents have not been assigned a capability subclass.

17B—Hagerstown-Opequon-Rock outcrop complex, 3 to 15 percent slopes. This complex consists of deep Hagerstown soils, shallow Opequon soils, and outcrops of limestone bedrock. The soils are undulating to rolling and well drained and are on narrow and broad ridges in the Shenandoah Valley. These soils are so intermingled that it was not practical to map them separately. This map unit is about 30 percent Hagerstown soils, 25 percent Opequon soils, 25 percent Rock outcrop, and 20 percent other soils. The outcrops of limestone bedrock are roughly 10 to 100 feet apart. Slopes are rough and complex and about 200 to 800 feet long. Areas of this complex are long and winding and range from about 5 to 150 acres.

Typically, the surface layer of the Hagerstown soil is brown silt loam about 6 inches thick. The subsoil extends to a depth of 49 inches. It is strong brown and yellowish red silty clay loam in the upper part and yellowish red silty clay in the lower part. The substratum is yellowish red silty clay with many highly weathered light gray limestone fragments. Hard limestone bedrock is at a depth of 52 inches.

Typically, the surface layer of the Opequon soil is dark yellowish brown silty clay about 8 inches thick. The subsoil is brown clay that is firm, very sticky, and very plastic. Hard limestone bedrock is at a depth of 17 inches.

Included with this complex in mapping are small intermingled areas of the Duffield, Nicholson, Pagebrook, Timberville, and Swimley soils. The Duffield and Nicholson soils are on ridges, in concave heads of drainageways, and in saddles. The Pagebrook and Timberville soils are in depressions and along narrow, winding drainageways. The Swimley soils are similar in location to the Hagerstown and Opequon soils. Also included are soils that have a cherty surface layer and soils that have a silty clay or clay surface layer.

The permeability of the Hagerstown soils is moderate, and that of the Opequon soils is moderately slow. The available water capacity is moderate in the Hagerstown soils and very low in the Opequon soils. Surface runoff is medium from the lower slopes and rapid from the steeper slopes. The erosion hazard is moderate to severe. The surface layer of the Hagerstown soils is friable, but the surface layer of the Opequon soils has a high clay content and is difficult to till. The Hagerstown soils have a moderate shrink-swell potential, and the Opequon soils have a high shrink-swell potential. The thickness of the root zone and depth to bedrock are 40 to 60 inches or more in the Hagerstown soils and 12 to 20 inches in the Opequon soils.

Both soils have high natural fertility. The Opequon soils have low organic matter content, and the Hagerstown soils have moderate organic matter content. The surface layer and upper part of the subsoil of the Hagerstown soils are very strongly acid or strongly acid unless lime has been applied. The lower part of the subsoil and the substratum range from strongly acid through moderately alkaline. The Opequon soils range from medium acid through mildly alkaline.

About half this complex is in pasture, and the remainder is in woodland.

This Hagerstown-Opequon-Rock outcrop complex is not suited to cultivated crops or to fruits, nuts, and berries. It has sufficient Rock outcrop to make the use of machinery for seedbed preparation and for cultivating, harvesting, and spraying of cultivated crops and trees impracticable. The very low available water capacity of the Opequon soils also reduces the size of fruit and affects the development of fruit buds.

This complex is moderately well suited to pasture. Rock outcrop limits the use of all but light machinery and hand tools for improving pasture. Rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Hagerstown soils for trees is very high, and that of the Opequon soils is moderately high. The high content of clay in both soils limits the use of heavy timber equipment, especially during periods of extreme wetness. The large amount of Rock outcrop also limits the use of equipment.

The depth to bedrock, slope, high clay content, shrink-swell potential, low soil strength, and closely spaced rock outcrops limit the use of this complex for septic tank absorption fields, sanitary landfills, dwellings, roads and streets, and most types of recreation. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields.

This Hagerstown-Opequon-Rock outcrop complex is in capability subclass VIs.

18—Hollywood clay loam. This soil is deep, nearly level, and moderately well drained. It is on broad intermittent drainageways in the Shenandoah Valley. Slopes are smooth and about 200 to 900 feet long. Areas of this soil are long and winding and range from about 10 to 100 acres. Slopes range from 0 to 4 percent.

Typically, the surface layer of this Hollywood soil is black clay loam about 12 inches thick. The subsurface layer is black silty clay to a depth of 19 inches. The substratum is dark gray, light olive brown, and gray clay

that is firm, sticky, and plastic and is mottled to a depth of at least 72 inches.

Included with this soil in mapping are small intermingled areas of the McGary, Pagebrook, Timberville, and Weaver soils. The McGary and Weaver soils are similar in location to the Hollywood soils. The Pagebrook and Timberville soils are in higher areas than the Hollywood soils. Also included are areas with a clay surface layer and areas that have limestone bedrock outcrops. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Hollywood soil is very slow, and the available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The surface layer and subsoil have a high clay content, and the shrink-swell potential is high. Deep, wide cracks form when the soil is dry, permitting water to enter rapidly. Then when the moisture content is high, the soil expands, closing the cracks and causing small mounds and swales to form on the surface. The thickness of the rooting depth and depth to bedrock are more than 48 inches. The soil has moderate natural fertility and organic matter content. It is mildly alkaline or moderately alkaline.

Areas of this soil are mostly in pasture. A small acreage is in woodland, and a small acreage is used for cultivated crops.

This Hollywood soil is poorly suited to cultivated crops. The high clay content of the surface layer and substratum severely limits tillage and the use of machinery. Conservation tillage reduces the effects of the high clay content on tillage operations. Crop yields can be increased by fertilizing, but liming is generally not needed.

This soil is also poorly suited to fruits, nuts, and berries. Poor air drainage causes freezing of fruit buds, and the high clay content of this soil limits the use of equipment.

This soil is moderately well suited to pasture. Weed control is a major concern because the high clay content limits the use of equipment. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Hollywood soil for trees is high; however, the high clay content severely restricts seedling survival and growth. The use of heavy timber equipment is also limited, especially during wet periods.

The very slow permeability, high clay content, and high shrink-swell potential of this soil are the main limitations for septic tank absorption fields, sanitary landfills, shallow excavations, dwellings, small commercial buildings, roads and streets, and most types of recreation. Sinkholes and solution channels in the limestone bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields.

This Hollywood soil is in capability subclass IIw.

19D—Laidig channery loam, 8 to 25 percent slopes. This rolling to hilly soil is deep and well drained. It is on colluvial fans, in concave heads of drainageways, and on toe slopes in the foothills of the Blue Ridge Mountains. Slopes are rough and complex and about 200 to 1,000 feet long. Areas of this soil are long and winding and range from about 5 to 150 acres.

Typically, the surface layer of this Laidig soil is very dark gray channery loam 2 inches thick. The subsurface layer is light yellowish brown channery loam to a depth of 14 inches. The subsoil is yellowish brown channery loam and channery sandy clay loam 18 inches thick. A firm, brittle fragipan extends to a depth of at least 60 inches. It is mostly yellowish brown very channery sandy loam and channery sandy loam.

Included with this soil in mapping are small intermingled areas of the Cardiff, Catoctin, Dekalb, Hazleton, Lew, Myersville, and Whiteford soils. The Cardiff, Catoctin, Dekalb, Hazleton, Myersville, and Whiteford soils are on uplands. The Lew soils are similar in location to the Laidig soils. Also included are areas that have stones on the surface and areas where there is less than 30 inches of soil over the fragipan. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Laidig soil is moderate above the fragipan and moderately slow in the fragipan. The available water capacity is low, and surface runoff is rapid. The erosion hazard is severe. The surface layer is friable but has a high content of coarse fragments. The subsoil has a low shrink-swell potential. The thickness of the root zone and depth to the fragipan are 30 to 50 inches. Depth to bedrock is more than 60 inches. The soil has low natural fertility and low organic matter content. It ranges from extremely acid through strongly acid unless lime has been applied. A perched seasonal high water table is above the fragipan at a depth of 2 1/2 to 4 feet during wet seasons from January through March.

Most areas of this soil are in woodland. A small acreage is used for pasture.

This Laidig soil is poorly suited to cultivated crops. The high content of coarse fragments and slope restrict equipment use and tillage operations. Also, the low available water capacity, low natural fertility, and soil acidity reduce crop yields.

This soil is poorly suited to fruits, nuts, and berries. The major limitations are the shallow rooting depth, low available water capacity, acidity, and low natural fertility. The low available water capacity, especially, reduces the size of fruit and affects the development of fruit buds. Slope also limits the use of equipment for spraying and weed control.

This soil is moderately well suited to pasture. Limitations are low available water capacity, acidity, and low natural fertility. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Laidig soil for trees is moderately high. Seedlings survive and grow well. Use of heavy equipment is somewhat limited on the steeper slopes.

The moderately slow permeability in the fragipan, perched seasonal high water table, slope, and high content of coarse fragments are the main limitations to use of this soil for septic tank absorption fields, sewage lagoons, sanitary landfills, shallow excavations, dwellings, and small commercial buildings. These limitations also affect most types of recreation.

This Laidig soil is in capability subclass IVe.

20D—Laidig very stony loam, 8 to 25 percent slopes. This rolling to hilly soil is deep and well drained. It is on colluvial fans, in concave heads of drainageways, and on toe slopes in the foothills of the Blue Ridge Mountains. Slopes are rough and complex and about 200 to 1,000 feet long. Flat stones more than 15 inches long and roughly 5 to 30 feet apart cover 3 to 15 percent of the surface. Areas of this soil are long and winding and range from about 50 to 100 acres.

Typically, the surface layer of this Laidig soil is very dark gray channery loam 2 inches thick. The subsurface layer is light yellowish brown channery loam to a depth of 14 inches. The subsoil is yellowish brown channery loam and channery sandy clay loam 18 inches thick. A firm, brittle fragipan extends to a depth of at least 60 inches. It is mostly yellowish brown very channery sandy loam and channery sandy loam.

Included with this soil in mapping are small intermingled areas of the Cardiff, Catoctin, Dekalb, Hazleton, Lew, Myersville, and Whiteford soils. The Cardiff, Catoctin, Dekalb, Hazleton, Myersville, and Whiteford soils are on uplands. The Lew soils are similar in location to the Laidig soils. Also included are areas that have more stones on the surface, areas that have fewer stones on the surface, and areas where there is less than 30 inches of soil over the fragipan. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Laidig soil is moderate above the fragipan and moderately slow in the fragipan. The available water capacity is low, and surface runoff is rapid. The erosion hazard is severe. The surface layer is friable but has a high content of coarse fragments and large stones. The subsoil has a low shrink-swell potential. The thickness of the root zone and depth to the fragipan are 30 to 50 inches. Depth to bedrock is more than 60 inches. The soil has low natural fertility and low organic matter content. It ranges from extremely acid through strongly acid unless lime has been applied. A perched seasonal high water table is above the fragipan at a depth of 2 1/2 to 4 feet during wet seasons from January through March.

Most areas of this soil are in woodland. A small acreage is used for pasture.

This Laidig soil is not suited to cultivated crops or to fruits, nuts, or berries. Stones on the surface limit the use of all but light machinery and hand tools. Other limitations are the shallow rooting depth, low available water capacity, acid reaction, low natural fertility, and high content of coarse fragments. The low available water capacity, especially, reduces the size of fruit and affects the development of fruit buds.

This soil is moderately well suited to pasture. Limitations are stones, low available water capacity, acid reaction, and low natural fertility. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Laidig soil for trees is moderately high. Seedlings survive and grow well. Use of heavy equipment is somewhat limited on the steeper slopes.

The moderately slow permeability in the fragipan, perched seasonal high water table, slope, and high content of coarse fragments and stones are the main limitations to use of this soil for septic tank absorption fields, sewage lagoons, sanitary landfills, shallow excavations, dwellings, and small commercial buildings. These limitations also affect most types of recreation.

This Laidig soil is in capability subclass VIs.

21B—Lakin loamy sand, 3 to 8 percent slopes. This undulating soil is deep and excessively drained. It is on moderately broad stream terraces along the Shenandoah River. Slopes are smooth and complex and about 200 to 900 feet long. Areas of this soil are long and winding and range from about 10 to 30 acres.

Typically, the surface layer of this Lakin soil is brown loamy sand about 10 inches thick. The subsurface layer and subsoil are yellowish brown loamy sand laminated with thin strata of dark yellowish brown sandy loam to a depth of 50 inches. The substratum is mottled yellowish brown, pale brown, and black loam to a depth of 61 inches. Below this it is mottled yellowish brown, pale brown, and black cobbly sandy loam to a depth of at least 70 inches.

Included with this soil in mapping are small intermingled areas of the Braddock, Monongahela, Thurmont, and Zoar soils. The Braddock soils are similar in location to the Lakin soils. The Monongahela, Thurmont, and Zoar soils are in depressions. Also included are areas of a soil that has a gravelly surface layer, and some areas that have sinkholes in limestone underlying the sandy alluvium. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Lakin soil is rapid, and the available water capacity is low. Surface runoff is slow. The erosion hazard is slight. The surface layer is very friable. The shrink-swell potential is low. The thickness of the root zone and depth to bedrock are more than 60 inches. The soil is low in natural fertility and organic matter content. It is strongly acid through medium acid unless lime has been applied.

Most areas of this soil are in pasture. A small acreage is cultivated, and some areas are in woodland.

This Lakin soil is moderately well suited to cultivated crops; however, the low available water capacity limits crop yields. Conservation tillage reduces runoff, helps control erosion, and conserves moisture. Crop yields can be increased by applying lime and fertilizer.

This soil is moderately well suited to fruits, nuts, and berries. The major limitation is the low available water capacity, which reduces the size of fruit and affects the development of fruit buds.

This soil is moderately well suited to pasture; however, the low available water capacity sometimes limits productivity. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Lakin soil for trees is moderate. Seedling survival and growth are limited by the low available water capacity. The sandy texture also limits the use of heavy timber equipment.

Seepage, caused by the high sand content of this soil, limits its use for septic tank absorption fields, sewage lagoons, and sanitary landfills. Seepage from sanitary facilities causes contamination of ground water. Sinkholes in some areas also increase the hazard of contamination of ground water by surface runoff and seepage from septic tank absorption fields. The high sand content also limits the use of the soil for shallow excavations, and the low available water capacity limits its use for lawns.

This Lakin soil is in capability subclass IIIs.

22C—Lew very stony silt loam, 8 to 15 percent slopes. This rolling soil is deep and well drained. It is on colluvial fans, in concave heads of drainageways, and on toe slopes in the foothills of the Blue Ridge Mountains. Slopes are rough and complex and about 200 to 1,000 feet long. Areas of this soil are long and winding and range from 5 to 100 acres. Stones more than 10 inches in diameter cover roughly 3 to 15 percent of the surface.

Typically, the surface layer of this Lew soil is dark reddish brown flaggy silt loam 1 inch thick. The subsurface layer is reddish brown flaggy silt loam to a depth of 7 inches. The subsoil extends to a depth of at least 63 inches. It is mostly reddish brown flaggy silt loam and flaggy silty clay loam to a depth of 26 inches. Below this it is mostly dark reddish brown gravelly silty clay loam and reddish brown very gravelly silty clay loam.

Included with this soil in mapping are small intermingled areas of the Catoctin, Dekalb, Laidig, and Myersville soils. The Catoctin, Dekalb, and Myersville soils are on uplands. The Laidig soils are similar in location to Lew soils. Also included are areas that have fewer stones and lower slopes. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Lew soil is moderate, and the available water capacity is low. Surface runoff is rapid. The erosion hazard is severe. The surface layer is friable but has a high content of coarse fragments and stones. The shrink-swell potential is moderate. The thickness of the root zone and depth to bedrock are 60 inches or more. The soil has moderate natural fertility and moderate organic matter content. It ranges from very strongly acid through medium acid unless lime has been applied.

Most areas of this soil are in woodland. A small acreage is used for pasture.

Stones and coarse fragments on the surface and slope limit the use of this Lew soil for cultivated crops and for fruits, nuts, and berries. Only light machinery and hand tools can be used for cultivating, planting, or harvesting operations. The low available water capacity also reduces the size of fruit and affects development of fruit buds.

This soil is moderately well suited to pasture. The major limitations are acidity, low available water capacity, stones, and a high content of coarse fragments. Stones and coarse fragments interfere with tillage. Establishing and maintaining a mixture of grasses and legumes, deferring grazing, rotating pastures, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Lew soil for trees is high. Seedlings generally survive and grow well if competing vegetation is controlled.

Slope and the high content of stones and coarse fragments are the main limitations to use of this soil for septic tank absorption fields, sewage lagoons, sanitary landfills, shallow excavations, and dwellings. These limitations also affect most types of recreation.

This Lew soil is in capability subclass VIs.

22D—Lew very stony silt loam, 15 to 30 percent slopes. This steep to very steep soil is deep and well drained. It is on colluvial fans, in concave heads of drainageways, and on foot slopes in the foothills of the Blue Ridge Mountains. Slopes are rough and complex and about 200 to 1,500 feet long. Areas of this soil are long and winding and range from 5 to 100 acres. Stones more than 10 inches in diameter cover roughly 3 to 15 percent of the surface.

Typically, the surface layer of this Lew soil is dark reddish brown flaggy silt loam 1 inch thick. The

subsurface layer is reddish brown flaggy silt loam to a depth of 6 inches. The subsoil extends to a depth of at least 63 inches. It is mostly reddish brown flaggy silt loam and flaggy silty clay loam to a depth of 24 inches. Below this it is mostly reddish brown gravelly silty clay loam and reddish brown very gravelly silty clay loam.

Included with this soil in mapping are small intermingled areas of the Catoctin, Dekalb, Laidig, and Myersville soils. The Catoctin, Dekalb, and Myersville soils are on uplands. The Laidig soils are similar in location to the Lew soils. Also included are areas that have fewer stones and steeper slopes. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Lew soil is moderate, and the available water capacity is low. Surface runoff is rapid. The erosion hazard is severe. The surface layer is friable but has a high content of coarse fragments. The shrink-swell potential is moderate. The thickness of the root zone and depth to bedrock are 60 inches or more. The soil has moderate natural fertility and moderate organic matter content. It ranges from very strongly acid through medium acid.

Most areas of this soil are in woodland.

Slope and the large number of stones and coarse fragments on the surface generally make this soil unsuitable for most uses other than woodland. The potential of this soil for trees is high; however, the large stones interfere with the use of timber harvesting equipment. Placing skid trails on the contour reduces the erosion hazard.

This Lew soil is in capability subclass VIIs.

23—Lobdell soils. These nearly level soils are deep and moderately well drained. They are on moderately broad flood plains of major streams in the Shenandoah Valley. Surface textures are highly variable and are mainly fine sandy loam, sandy loam, loam, or silt loam along the Shenandoah River and loam or silt loam along Opequon Creek. Areas of these soils are long and winding and range from about 5 to 50 acres. Slopes range from 0 to 3 percent.

Typically, the surface layer of a Lobdell soil is dark brown loam about 9 inches thick. The subsoil is dark brown loam to a depth of 26 inches and is mottled in the lower part. The substratum is dark yellowish brown loam mottled with grayish brown to a depth of at least 64 inches.

Included with these soils in mapping are small intermingled areas of the Buckton, Chagrin, and Weaver soils. The Buckton and Chagrin soils are in slightly higher areas. The Weaver soils are similar in location to the Lobdell soils. Also included are soils that have a seasonal high water table near the surface. Areas of included soils make up about 20 percent of this map unit.

The permeability of these Lobdell soils is moderate, and the available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The surface layer is friable and easily tilled. The soil has a low shrink-swell potential. The thickness of the root zone and depth to bedrock are more than 60 inches. These soils have high natural fertility and moderate organic matter content. They range from strongly acid through neutral in the surface layer and subsoil and from medium acid through neutral in the substratum. A seasonal high water table is at a depth of 2 to 3 1/2 feet, mostly from December through April. Also, the soils are occasionally flooded for brief periods from January through April.

These Lobdell soils are well suited to cultivated crops, and most of the acreage is farmed. However, flooding occasionally damages crops or limits the use of machinery. Tilth is good. Crop yields can be increased by applying fertilizer. Conservation tillage conserves moisture and reduces erosion. Row crops can be grown continuously on these soils.

These soils are poorly suited to fruits, nuts, and berries, mainly because poor air drainage causes freezing of fruit buds. Flooding limits use of machinery for spraying and weed control.

These soils are well suited to pasture and hay grasses. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying fertilizer increase the productivity and carrying capacity of pastures.

The potential of these Lobdell soils for trees is very high; however, most areas are farmed. Occasional flooding limits the use of equipment in managing and harvesting timber.

Flooding and the seasonal high water table are the major limitations to the use of these soils for septic tank absorption fields, sanitary facilities, shallow excavations, dwellings, and small commercial buildings. Flooding is also a limitation for camp areas and playgrounds.

These Lobdell soils are in capability subclass IIw.

24—McGary silty clay loam. This soil is deep, nearly level, and somewhat poorly drained. It is on broad, intermittent drainageways in the Shenandoah Valley. Slopes are smooth and about 200 to 900 feet long. They range from 0 to 3 percent. Areas of this soil are long and winding and range from about 10 to 100 acres.

Typically, the surface layer of this McGary soil is grayish brown silty clay loam about 9 inches thick. The subsoil extends to a depth of 42 inches. It is mottled light gray and yellowish brown clay loam to a depth of 14 inches. Below this it is mostly gray clay and light brownish gray clay loam mottled with yellowish brown. The substratum is light brownish gray clay loam mottled with yellowish brown to a depth of at least 60 inches.

Included with this soil in mapping are small intermingled areas of the Hollywood, Pagebrook,

Timberville, and Weaver soils. The Hollywood and Weaver soils are similar in location to the McGary soils. The Pagebrook and Timberville soils are in higher areas. Also included are areas that have water on the surface during periods of high rainfall or from January through April. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this McGary soil is slow, and the available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The surface layer has a high content of clay, which causes tillage to be poor. The soil has a high shrink-swell potential. The thickness of the root zone and depth to bedrock are 60 inches or more. The soil has high natural fertility and moderate organic matter content. The surface layer and upper part of the subsoil are neutral or mildly alkaline, and the lower part of the subsoil and the substratum range from slightly acid through mildly alkaline. A seasonal high water table is at a depth of 1 to 3 feet from January through April.

Most areas of this soil are in pasture. A small acreage is farmed, and some areas are in woodland.

This McGary soil is moderately well suited to cultivated crops. The major limitations are the wetness and high clay content of the surface layer. Wetness interferes with seedbed preparation and planting and harvesting operations, and the high clay content causes poor tilth. Conservation tillage and plowing at optimum moisture content offset these limitations. Crop yields can be increased by fertilizing, but liming is generally not needed.

This soil is poorly suited to fruits, nuts, and berries because poor air drainage causes freezing of fruit buds. Use of equipment is also limited during periods of wetness.

This soil is moderately well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying fertilizer increase the productivity and carrying capacity of pastures.

The potential of this McGary soil for trees is moderately high. Seedling survival and growth is limited by wetness and the large amount of clay in the surface layer. Use of equipment is also limited during periods of wetness.

The seasonal high water table, high shrink-swell potential, slow permeability, and low strength limit the use of this soil for septic tank absorption fields, sewage lagoons, sanitary landfills, shallow excavations, dwellings, small commercial buildings, and roads and streets. These limitations also affect most types of recreation.

This McGary soil is in capability subclass IIIw.

25B—Monongahela loam, 3 to 8 percent slopes. This gently sloping soil is deep and moderately well drained. It is on high stream terraces in the Shenandoah Valley. Slopes are smooth and about 200 to 600 feet long. Areas of this soil are long and winding to oval and range from about 2 to 40 acres.

Typically, the surface layer of this Monongahela soil is brown loam about 9 inches thick. The subsoil is yellowish brown loam to a depth of 21 inches. Below this a brittle, firm fragipan extends to a depth of at least 60 inches. It is mostly light yellowish brown, yellowish brown, and strong brown clay loam.

Included with this soil in mapping are small intermingled areas of the Braddock, Monongahela, Poplimento, Thurmont, Webbtown, and Zoar soils. The Braddock, Monongahela, Thurmont, and Zoar soils are similar in location to the Monongahela soils. The Poplimento and Webbtown soils commonly are near the boundaries of the unit. Also included in some areas are sinkholes in residual limestone rock. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Monongahela soil is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate, and surface runoff is medium. The erosion hazard is moderate. The surface layer is friable. The shrink-swell potential is low. The root zone extends to the top of the fragipan, which ranges from 18 to 30 inches below the surface. Depth to bedrock is more than 60 inches. The soil has low natural fertility and low organic matter content. It is very strongly acid or strongly acid unless lime has been applied. A perched seasonal high water table is above the fragipan at a depth of 1 1/2 to 3 feet from December through April.

Most areas of this soil are cultivated or used for pasture. A small acreage is in woodland.

This Monongahela soil is moderately well suited to cultivated crops. The shallow rooting depth, acidity, and low natural fertility are limitations to plant growth and crop yields. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, conserve moisture, and maintain organic matter content. Crop yields can be increased by applying lime and fertilizer.

This soil is moderately well suited to fruits, nuts, and berries if air drainage is adequate. Shallow rooting depth, soil acidity, and low natural fertility may limit plant growth and crop yields.

This soil is moderately well suited to pasture. The shallow rooting depth, acidity, and low natural fertility are limitations to plant growth and yields. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Monongahela soil for trees is moderately high. Seedlings survive and grow well if competing vegetation is controlled.

Slow permeability in the fragipan and the perched seasonal high water table limit the use of this soil for septic tank absorption fields, sewage lagoons, sanitary landfills, shallow excavations, dwellings, and small commercial buildings. These limitations also affect most types of recreation.

This Monongahela soil is in capability subclass IIe.

26B—Monongahela-Braddock complex, 3 to 8 percent slopes. This gently sloping complex consists of deep and moderately well drained Monongahela soils and well drained Braddock soils. These soils are on moderately broad ridges in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. This complex is about 45 percent Monongahela soils, 35 percent Braddock soils, and 20 percent other soils. Slopes are smooth and about 200 to 600 feet long. Areas of this complex are long and winding or oval and range from about 5 to 75 acres.

Typically, the surface layer of the Monongahela soil is brown cobbly loam about 9 inches thick. The subsoil is yellowish brown cobbly loam to a depth of 21 inches. Below this a brittle, firm fragipan extends to a depth of at least 60 inches. It is mainly yellowish brown and strong brown cobbly sandy clay loam.

Typically, the surface layer of the Braddock soil is black gravelly loam about 2 inches thick. The subsurface layer is yellowish brown gravelly loam 9 inches thick. The subsoil extends to a depth of 41 inches. It is mainly red gravelly clay and dark red gravelly sandy clay. The substratum is dark red very gravelly sandy clay loam with olive and brown mottles to a depth of at least 74 inches.

Included with this complex in mapping are small intermingled areas of the Poplimento, Thurmont, Webbtown, and Zoar soils. The Poplimento and Webbtown soils are near the boundaries of the map unit. The Thurmont and Zoar soils are similar in location to the Monongahela and Braddock soils. Also included are areas that are very gravelly and areas that are very cobbly. Areas of the included soils make up about 20 percent of this map unit.

The permeability of the Monongahela soils is moderate above the fragipan and slow in the fragipan. Permeability is moderate in the Braddock soils. The available water capacity is moderate in both soils. Surface runoff is medium. The erosion hazard is moderate. The surface layer of both soils has a high content of coarse fragments. The shrink-swell potential of the Monongahela soils is low, and that of the Braddock soils is moderate. The root zone extends to the top of the fragipan, which is at a depth of 18 to 30 inches in the Monongahela soils and more than 60 inches in the Braddock soils. Depth to bedrock is more than 60 inches in both soils.

Both soils have low natural fertility and low organic matter content. Both soils are very strongly acid or strongly acid unless lime has been applied. The Monongahela soils have a perched seasonal high water table above the fragipan from December through April.

Most areas of this complex are used for pasture. A small acreage is cultivated, and some areas are in woodland.

This Monongahela-Braddock complex is moderately well suited to cultivated crops. The major limitations are the high content of coarse fragments, acidity, and low natural fertility in both soils and the shallow rooting depth in the Monongahela soils. Tilth is poor because the high content of coarse fragments interferes with seedbed preparation and cultivation. Crop yields can be increased by applying lime and fertilizer. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, conserve moisture, and maintain organic matter content.

This complex is moderately well suited to fruits, nuts, and berries if air drainage is adequate. The shallow rooting depth in the Monongahela soil and the acidity and low natural fertility in both soils may limit plant growth and crop yields.

This complex is moderately well suited to pasture. The shallow rooting depth in the Monongahela soils and the acidity and low natural fertility in both soils are limitations to plant growth and yields. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Monongahela soils for trees is moderately high, and that of the Braddock soils is high. Seedlings survive and grow well if competing vegetation is controlled. Cobbles on the surface limit the use of some equipment on this complex.

Slow permeability in the fragipan and the perched seasonal high water table in the Monongahela soils, the high content of coarse fragments in both soils, and the moderate shrink-swell potential in the Braddock soils limit the use of this complex for septic tank absorption fields, sewage lagoons, sanitary landfills, shallow excavations, cover for landfills, dwellings, small commercial buildings, and local roads and streets. These limitations also affect most types of recreation.

This Monongahela-Braddock complex is in capability subclass IIIe.

26C—Monongahela-Braddock complex, 8 to 15 percent slopes. This rolling complex consists of deep and moderately well drained Monongahela soils and well drained Braddock soils. These soils are on narrow side slopes in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. This map unit is about 40 percent Monongahela soils, 35 percent Braddock soils, and 25 percent other soils. Slopes are complex and about 200 to 500 feet long. Areas of this complex are long and winding or oval and range from about 5 to 40 acres.

Typically, the surface layer of the Monongahela soil is brown cobbly loam about 7 inches thick. The subsoil is yellowish brown cobbly loam to a depth of 18 inches. Below this a brittle, firm fragipan extends to a depth of at least 60 inches. It is mainly yellowish brown and strong brown cobbly sandy clay loam.

Typically, the surface layer of the Braddock soil is black gravelly loam about 2 inches thick. The subsurface layer is yellowish brown gravelly loam 6 inches thick. The subsoil extends to a depth of 41 inches. It is mainly red gravelly clay and dark red gravelly sandy clay. The substratum is dark red very gravelly sandy clay loam with olive and brown mottles to a depth of 74 inches.

Included with this complex in mapping are small intermingled areas of the Poplimento, Thurmont, Webbtown, and Zoar soils. The Poplimento and Webbtown soils are near the boundaries of the map unit. The Thurmont and Zoar soils are similar in location to the Monongahela and Braddock soils. Also included are areas that are very gravelly and areas that are very cobbly. Areas of the included soils make up about 25 percent of this map unit.

The permeability of the Monongahela soils is moderate above the fragipan and slow in the fragipan. Permeability is moderate in the Braddock soils. The available water capacity is moderate in both soils, and surface runoff is medium. The erosion hazard is severe. The surface layer of both soils has a high content of coarse fragments. The shrink-swell potential of the Monongahela soils is low, and that of the Braddock soils is moderate. The root zone extends to the top of the fragipan, which is 18 to 30 inches below the surface in the Monongahela soils and more than 60 inches in the Braddock soils. Depth to bedrock is more than 60 inches in both soils.

Both soils have low natural fertility and low organic matter content. Both soils are very strongly acid or strongly acid unless lime has been applied. A perched seasonal high water table is above the fragipan in the Monongahela soils from December through April.

Most areas of this complex are used for pasture. A small acreage is cultivated, and some areas are in woodland.

This Monongahela-Braddock complex is poorly suited to cultivated crops. The major limitations are the high content of coarse fragments, slope, acidity, and low natural fertility in both soils and the shallow rooting depth in the Monongahela soils. Tilth is poor because the high content of coarse fragments interferes with seedbed preparation and cultivation. Crop yields can be increased by applying lime and fertilizer. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, conserve moisture, and maintain organic matter content.

This complex is moderately well suited to fruits, nuts, and berries if air drainage is adequate. The shallow rooting depth in the Monongahela soil and the acidity and low natural fertility in both soils may limit plant growth and crop yields.

This complex is moderately well suited to pasture. The shallow rooting depth in the Monongahela soils and the acidity and low natural fertility in both soils are limitations to plant growth and crop yields. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Monongahela soils for trees is moderately high, and that of the Braddock soils is high. Seedlings survive and grow well if competing vegetation is controlled. Cobbles on the surface limit the use of some equipment on this complex.

Slow permeability in the fragipan and the perched seasonal high water table in the Monongahela soils, the high content of coarse fragments in both soils, slope, and the moderate shrink-swell potential in the Braddock soils limit the use of this complex for septic tank absorption fields, sewage lagoons, sanitary landfills, shallow excavations, cover for landfills, dwellings, small commercial buildings, and local roads and streets. These limitations also affect most types of recreation.

This Monongahela-Braddock complex is in capability subclass IVe.

27B—Monongahela-Zoar complex, 3 to 8 percent slopes. This gently sloping complex consists of deep, moderately well drained, loamy Monongahela soils and clayey Zoar soils. These soils are on stream terraces in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. This map unit is about 50 percent Monongahela soils, 30 percent Zoar soils, and 20 percent other soils. Slopes are smooth and about 200 to 500 feet long. Areas of this complex are long and winding or oval and range from about 3 to 30 acres.

Typically, the surface layer of the Monongahela soil is brown loam about 9 inches thick. The subsoil is yellowish brown loam to a depth of 21 inches. Below this a brittle, firm fragipan extends to a depth of at least 60 inches. It is mainly yellowish brown and strong brown clay loam.

Typically, the surface layer of the Zoar soil is brown silt loam about 7 inches thick. The subsoil extends to a depth of at least 73 inches. It is dark brown loam and clay to a depth of 23 inches, yellowish brown clay mottled with pale brown and gray to a depth of 41 inches, and mottled strong brown, light brownish gray, yellowish brown, and dark brown clay below that.

Included with this complex in mapping are small intermingled areas of the Braddock, Thurmont, and Timberville soils. The Braddock and Thurmont soils are similar in location to the Monongahela and Zoar soils. The Timberville soils are in depressions and in heads of drainageways. Also included are severely eroded spots

that have a silty clay loam, clay loam, or clay surface layer.

The permeability of the Monongahela soils is moderate above the fragipan and slow in the fragipan. Permeability is slow in the Zoar soils. The available water capacity is moderate in both soils, and surface runoff is medium. The erosion hazard is moderate. The surface layer of both soils is friable. The shrink-swell potential of the Monongahela soils is low and that of the Zoar soils is moderate. The root zone extends to the top of the fragipan, which is 18 to 30 inches below the surface in the Monongahela soils. The root zone is more than 60 inches deep in the Zoar soils. Depth to bedrock is more than 60 inches in both soils.

Both soils have low natural fertility and low organic matter content. Both soils are very strongly acid or strongly acid unless lime has been applied. A perched seasonal high water table is above the fragipan in the Monongahela soils and is at a depth of 1 1/2 to 2 1/2 feet in the Zoar soils from December through April.

Most areas of this complex are used for pasture. A small acreage is cultivated, and some areas are in woodland.

This Monongahela-Zoar complex is moderately well suited to cultivated crops. The major limitations are the high content of clay in the Zoar soils and an acid reaction, low natural fertility, and shallow rooting depth in the Monongahela soils. Tilth is only fair in the Zoar soils because of the high content of clay in the surface layer. Wetness sometimes delays seedbed preparation, cultivating, and harvesting. Crop yields can be increased by lime and fertilizer. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, conserve moisture, and maintain organic matter content.

This complex is moderately well suited to fruits, nuts, and berries if air drainage is adequate. The shallow rooting depth in the Monongahela soils and the acidity and low natural fertility in both soils sometimes limit plant growth and crop yields.

This complex is moderately well suited to pasture. The shallow rooting depth in the Monongahela soils and the acidity and low natural fertility in both soils are limitations to plant growth and yields. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Monongahela and Zoar soils for trees is moderately high. Seedlings survive and grow well if competing vegetation is controlled. Wetness and the high clay content of the Zoar soils limit the use of some equipment, especially during periods of extremely high rainfall.

Slow permeability and the perched seasonal high water table in both soils and the moderate shrink-swell potential in the Zoar soils limit the use of this complex for septic tank absorption fields, sewage lagoons, sanitary landfills, shallow excavations, cover for landfills, dwellings, small commercial buildings, and local roads and streets. These limitations also affect most types of recreation.

This Monongahela-Zoar complex is in capability subclass IIe.

28B—Myersville-Catoctin silt loams, 3 to 8 percent slopes. This complex consists of deep Myersville soils and moderately deep Catoctin soils. The soils are gently sloping and well drained and are on broad ridges along the crest of the Blue Ridge Mountains. These soils are so intermingled that it was not practical to map them separately. This map unit is about 45 percent Myersville soils, 40 percent Catoctin soils, and 15 percent other soils. Slopes are smooth and about 200 to 600 feet long. Areas of this complex are long and winding to oval and range from about 5 to 20 acres.

Typically, the surface layer of the Myersville soil is dark reddish brown silt loam about 10 inches thick. The subsoil extends to a depth of 47 inches. It is reddish brown and yellowish red clay loam to a depth of 35 inches and yellowish red channery clay loam below this. The substratum is yellowish red very channery clay loam to a depth of at least 62 inches.

Typically, the surface layer of the Catoctin soil is brown silt loam about 8 inches thick. The subsoil extends to a depth of 24 inches. It is yellowish brown channery silt loam in the upper part and strong brown channery silt loam interrupted by lenses and pockets of silty clay loam in the lower part. The substratum is mottled yellowish brown very channery silt loam. Hard greenstone bedrock is at a depth of 32 inches.

Included with these soils in mapping are small intermingled areas of the Cardiff, Dekalb, Hazleton, and Lew soils. The Cardiff, Dekalb, and Hazleton soils are similar in location to the Catoctin and Myersville soils. The Lew soils are in depressions and in heads of drainageways. Also included are areas where rock outcrops and stones more than 10 inches in diameter cover roughly 3 to 15 percent of the surface.

The permeability is moderate in the Myersville soils and moderately rapid in the Catoctin soils. The available water capacity is moderate in the Myersville soils and low in the Catoctin soils. Surface runoff is medium. The erosion hazard is moderate. The surface layer of both soils is friable and easily tilled. The subsoil of both soils has a low shrink-swell potential. The root zone extends to bedrock, which is at a depth of more than 60 inches in the Myersville soils and 20 to 40 inches in the Catoctin soils. Both soils are medium in natural fertility and moderate in organic matter content. Both soils generally are strongly acid or medium acid unless lime has been applied.

Most areas of this complex are in woodland. A small acreage is in pasture or is used for cultivated crops.

This Myersville-Catoctin complex is moderately well suited to cultivated crops. The Catoctin soils have low available water capacity, which limits crop yields, especially during periods of excessive wetness. Stones in some areas also interfere with tillage. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Yields can be increased by applying lime and fertilizer if moisture is available.

This complex is moderately well suited to fruits, nuts, and berries. The low available water capacity and shallow rooting depth in the Catoctin soils limit crop yields. The low available water capacity, especially, reduces the size of fruit and affects development of the fruit buds.

This complex is well suited to pasture. The low available water capacity in the Catoctin soils and the acidity in both soils limit crop yields. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Myersville soils for trees is very high, and that of the Catoctin soils is moderate. Seedling survival is limited by the low available water capacity and shallow depth to bedrock of the Catoctin soils.

Moderate permeability in the Myersville soils and seepage in both soils limit the use of this complex for septic tank absorption fields and sewage lagoons. Depth to bedrock limits use of the Catoctin soils for sanitary facilities, shallow excavations, dwellings, roads and streets, and small commercial buildings.

This Myersville-Catoctin complex is in capability subclass IIe.

28C—Myersville-Catoctin silt loams, 8 to 15 percent slopes. This complex consists of deep Myersville soils and moderately deep Catoctin soils. The soils are sloping and well drained and are on narrow side slopes along the crest of the Blue Ridge Mountains. They are so intermingled that it was not practical to map them separately. This map unit is about 45 percent Myersville soils, 40 percent Catoctin soils, and 15 percent other soils. Slopes are smooth and about 200 to 500 feet long. Areas of this complex are long and winding and range from about 5 to 20 acres.

Typically, the surface layer of the Myersville soil is dark reddish brown silt loam about 8 inches thick. The subsoil extends to a depth of 40 inches. It is reddish brown and yellowish red clay loam to a depth of 32 inches and yellowish red channery clay loam below this. The substratum is yellowish red very channery clay loam to a depth of at least 62 inches.

Typically, the surface layer of the Catoctin soil is brown silt loam about 6 inches thick. The subsoil extends to a depth of 24 inches. It is yellowish brown channery silt loam in the upper part and strong brown channery silt loam interrupted by lenses and pockets of silty clay loam in the lower part. The substratum is mottled yellowish brown very channery silt loam. Hard greenstone bedrock is at a depth of 28 inches.

Included with these soils in mapping are small intermingled areas of the Cardiff, Dekalb, Hazleton, and Lew soils. The Cardiff, Dekalb, and Hazleton soils are similar in location to the Catoctin and Myersville soils. The Lew soils are in depressions and in heads of drainageways. Also included are areas of rock outcrops and areas where stones more than 10 inches in diameter cover roughly 3 to 15 percent of the surface.

The permeability is moderate in the Myersville soils and moderately rapid in the Catoctin soils. The available water capacity is moderate in the Myersville soils and low in the Catoctin soils. Surface runoff is medium. The erosion hazard is severe. The surface layer of both soils is friable and easily tilled. The subsoil of both soils has a low shrink-swell potential. The root zone extends to bedrock, which is at a depth of more than 60 inches in the Myersville soils and 20 to 40 inches in the Catoctin soils. Both soils are medium in natural fertility, and their organic matter content is moderate. Both soils commonly are strongly acid or medium acid unless lime has been applied.

Most areas of this complex are in woodland. A small acreage is in pasture or is used for cultivated crops.

This Myersville-Catoctin complex is moderately well suited to cultivated crops. The low available water capacity of the Catoctin soils limits crop yields, especially during periods of excessive wetness. Stones in some areas also interfere with tillage. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Yields can be increased by applying lime and fertilizer if moisture is available.

This complex is moderately well suited to fruits, nuts, and berries. The low available water capacity and shallow rooting depth in the Catoctin soils limit crop yields. The low available water capacity, especially, reduces the size of fruit and affects development of the fruit buds.

This complex is well suited to pasture. The low available water capacity in the Catoctin soils and the acidity in both soils limit crop yields. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Myersville soils for trees is very high, and that of the Catoctin soils is moderate. Seedling survival is limited by the low available water capacity and depth to bedrock of the Catoctin soils.

Moderate permeability in the Myersville soils and seepage and slope limit the use of this complex for septic tank absorption fields and sewage lagoons. Depth to bedrock limits use of the Catoctin soils for sanitary

facilities, shallow excavations, dwellings, roads and streets, and small commercial buildings.

This Myersville-Catoctin complex is in capability subclass IIIe.

29C—Myersville-Catoctin very stony silt loams, 8 to 15 percent slopes. This complex consists of deep Myersville soils and moderately deep Catoctin soils. The soils are sloping and well drained and are on broad side slopes in the Blue Ridge Mountains. These soils are so intermingled that it was not practical to map them separately. This map unit is about 45 percent Myersville soils, 40 percent Catoctin soils, and 15 percent other soils. Slopes are smooth and about 200 to 1,500 feet long. Areas of this complex are long and winding and range from about 5 to 200 acres. Stones larger than 10 inches in diameter cover roughly 3 to 15 percent of the surface.

Typically, the surface layer of the Myersville soil is dark reddish brown silt loam about 8 inches thick. The subsoil extends to a depth of 40 inches. It is reddish brown and yellowish red clay loam to a depth of 32 inches and yellowish red channery clay loam below this. The substratum is yellowish red very channery clay loam to a depth of at least 62 inches.

Typically, the surface layer of the Catoctin soil is brown cobbly silt loam about 8 inches thick. The subsoil extends to a depth of 24 inches. It is yellowish brown channery silt loam in the upper part and strong brown channery silt loam interrupted by lenses and pockets of silty clay loam in the lower part. The substratum is mottled yellowish brown very channery silt loam. Hard greenstone bedrock is at a depth of 32 inches.

Included with these soils in mapping are small intermingled areas of the Cardiff, Dekalb, Hazleton, and Lew soils. The Cardiff, Dekalb, and Hazleton soils are similar in location to the Catoctin and Myersville soils. The Lew soils are in depressions and in heads of drainageways. Also included are areas of rock outcrops and areas that do not have stones on the surface.

The permeability is moderate in the Myersville soils and moderately rapid in the Catoctin soils. The available water capacity is moderate in the Myersville soils and low in the Catoctin soils. Surface runoff is medium. The erosion hazard is severe. The surface layer of both soils is friable and easily tilled. The subsoil of both soils has a low shrink-swell potential. The root zone extends to bedrock, which is at a depth of more than 60 inches in the Myersville soils and at 20 to 40 inches in the Catoctin soils. Both soils are medium in natural fertility and moderate in organic matter content. Both soils generally are strongly acid or medium acid unless lime has been applied.

Most areas of this complex are in woodland. A small acreage is in pasture.

This complex is not suited to cultivated crops and is poorly suited to fruits, nuts, and berries. Stones on the surface limit the use of all but very light machinery and hand tools. Also, the low available water capacity in the Catoctin soils reduces the size of fruit and limits development of fruit buds.

This complex is moderately well suited to pasture, but large stones on the surface limit the use of most machinery, except very light machinery and hand tools. The low available water capacity in the Catoctin soils and the acidity in both soils limit crop yields. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Myersville soils for trees is very high, and that of the Catoctin soils is moderate. Seedling survival is limited by the available water capacity and depth to bedrock in the Catoctin soils.

Moderate permeability in the Myersville soils and slope and seepage in both soils limit the use of this complex for septic tank absorption fields and sewage lagoons. Large stones on the surface and depth to bedrock limit use of the Catoctin soils for sanitary facilities, shallow excavations, dwellings, roads and streets, and small commercial buildings.

This Myersville-Catoctin complex is in capability subclass VIs.

30B—Nicholson-Duffield silt loams, 3 to 8 percent slopes. This complex consists of moderately well drained Nicholson soils and well drained Duffield soils. The soils are gently sloping and are on narrow to broad ridges, in depositional areas below retreating erosional slopes, and on small knolls in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. This map unit is about 50 percent Nicholson soils, 35 percent Duffield soils, and 15 percent other soils. Slopes are smooth and about 200 to 500 feet long. Areas of this complex are long and winding to oval and range from 5 to 40 acres.

Typically, the surface layer of the Nicholson soil is dark yellowish brown silt loam about 10 inches thick. The subsoil extends to a depth of at least 60 inches. It is yellowish brown silt loam in the upper 13 inches; is a firm, yellowish brown silt loam fragipan to a depth of 36 inches; and below this is yellowish red silty clay stained with black.

Typically, the surface layer of the Duffield soil is dark yellowish brown silt loam about 10 inches thick. The subsoil extends to a depth of 65 inches. It is yellowish brown silt loam in the upper 7 inches and is yellowish brown silty clay loam mottled with brown, strong brown, and pale brown in the lower part. The substratum is yellowish brown silt loam mottled with brown and white to a depth of at least 88 inches.

Included with these soils in mapping are small intermingled areas of the Carbo, Poplimento, and Timberville soils. The Carbo and Poplimento soils are

similar in location to the Nicholson and Duffield soils. The Timberville soils are in depressions and in heads of drainageways.

The permeability of the Nicholson soils is slow, and the permeability of this Duffield soils is moderate. The available water capacity is moderate in the Nicholson soils and high in the Duffield soils. Surface runoff is medium. The erosion hazard is moderate. The surface layer of both soils is friable and easily tilled. The shrink-swell potential of the Nicholson soils is low above the fragipan and moderate below the fragipan. The Duffield soils have moderate shrink-swell potential. The root zone in the Nicholson soils extends to the fragipan, a depth of 20 to 30 inches, and the root zone of the Duffield soils is more than 60 inches deep. Depth to bedrock is more than 60 inches in the Nicholson soils and more than 48 inches in the Duffield soils.

The Nicholson soils have medium natural fertility, and the Duffield soils have low natural fertility. Organic matter content is low for both soils. The Nicholson soils range from very strongly acid through medium acid through the fragipan and from strongly acid through mildly alkaline below the fragipan. Unless lime has been applied, the Duffield soils range from strongly acid through neutral in the surface layer and subsoil and from strongly acid through slightly acid in the substratum. The Nicholson soils have a perched seasonal high water table above the fragipan from January through April.

Most areas of this complex are used for cultivated crops or pasture. A small acreage is in woodland.

This Nicholson-Duffield complex is well suited to cultivated crops. Contour tillage, conservation tillage, additions of lime and fertilizer, and crop rotations that include grasses and legumes reduce runoff, help control erosion, conserve moisture, and increase crop yields.

This complex is moderately well suited to fruits, nuts, and berries if air drainage is adequate. Its use for crops is limited by acidity in both soils and low natural fertility in the Duffield soils. Yields can be increased by applying lime and fertilizer.

This complex is well suited to pasture. Such use, however, is limited by acidity in both soils and low natural fertility in the Duffield soils. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Nicholson soils for trees is high, and that of the Duffield soils is very high. Seedlings survive and grow well if competing vegetation is controlled.

The slow permeability and perched seasonal high water table in the Nicholson soils and the moderate shrink-swell potential and depth to bedrock in the Duffield soils limit the use of this complex for sanitary facilities, dwellings, and some types of recreation. The low strength of both soils is a limitation for local roads and streets.

This Nicholson-Duffield complex is in capability subclass IIe.

31B—Oaklet silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on narrow to moderately broad ridges in the Shenandoah Valley. Slopes are smooth and about 200 to 800 feet long. Areas of this soil are oval to long and winding and range from about 5 to 80 acres.

Typically, the surface layer of this Oaklet soil is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of at least 90 inches. It is mainly strong brown clay that is very sticky and very plastic, and it has light gray and yellowish red mottles below a depth of 60 inches.

Included with this soil in mapping are small intermingled areas of the Carbo, Opequon, Nicholson, Pagebrook, and Timberville soils. The Carbo and Opequon soils are similar in location to the Oaklet soils but are generally near rock outcrops. The Nicholson soils are in depositional areas below erosional slopes, on small knolls, and on ridges. The Pagebrook and Timberville soils are in depressions and saddles, on foot slopes, and along narrow, intermittent drainageways. Also included in mapping are areas where the surface layer is silty clay loam or clay. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Oaklet soil is slow, and the available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer is friable and easily tilled, except in eroded areas that have a high clay content. The subsoil has a high shrink-swell potential. The thickness of the root zone and depth to bedrock are more than 60 inches. The soil has high natural fertility and low organic matter content. The surface layer and upper part of the subsoil range from very strongly acid through slightly acid unless lime has been applied. The lower part of the subsoil ranges from strongly acid through moderately alkaline.

Most areas of this soil are cultivated or used for pasture. A small acreage is in orchards and woodland.

This Oaklet soil is well suited to cultivated crops. Soil acidity is a limitation in some areas. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is fair but can be improved and maintained by incorporating organic matter into the soil and by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This soil is moderately well suited to fruits, nuts, and berries. Poor air drainage is a limitation in some areas. Yields can be increased by applying lime and fertilizer.

This soil is well suited to pasture. Soil acidity is a limitation in some areas. Establishing and maintaining a mixture of grasses and legumes, rotating pastures,

deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Oaklet soil for trees is high. The high content of clay often limits the use of heavy timber equipment, especially during periods of wetness.

Slow permeability limits the use of this soil for septic tank absorption fields and some types of recreation. High clay content is a limitation for trench type sanitary landfills, cover for landfills, and shallow excavations. High shrink-swell potential and low soil strength are limitations for dwellings, small commercial buildings, and local roads and streets. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields.

This Oaklet soil is in capability subclass IIe.

32B—Oaklet-Carbo complex, rocky, 3 to 8 percent slopes. This complex consists of deep Oaklet soils and moderately deep Carbo soils. The soils are gently sloping and well drained and are on broad ridges in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. This map unit is about 40 percent Oaklet soils, 35 percent Carbo soils, and 25 percent other soils. Outcrops of limestone bedrock are roughly 100 to 300 feet apart. Slopes are smooth and about 200 to 900 feet long. Areas of this complex are roughly oval to long and winding and range from about 5 to 150 acres.

Typically, the surface layer of the Oaklet soil is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of at least 90 inches. It is mainly strong brown clay that is very sticky and very plastic, and it has gray and red mottles below a depth of 60 inches.

Typically, the surface layer of the Carbo soil is brown silty clay loam about 7 inches thick. The subsoil extends to a depth of 37 inches. It is mainly yellowish brown and dark yellowish brown clay that is firm, very sticky, and very plastic. Hard limestone bedrock is at a depth of 37 inches.

Included with these soils in mapping are small intermingled areas of the Duffield, Nicholson, Opequon, Pagebrook, and Timberville soils. The Duffield and Nicholson soils are in depositional areas below erosional slopes, on small knolls, and on ridges. The Opequon soils are near rock outcrops. The Pagebrook and Timberville soils are in depressions and saddles and along narrow, intermittent drainageways. Also included are areas that do not have outcrops of limestone bedrock and areas where there is chert on the surface.

The permeability of these Oaklet soils and Carbo soils is slow. The available water capacity is moderate in the Oaklet soils and low in the Carbo soils. Surface runoff is medium. The erosion hazard is moderate. The surface layer of the Oaklet soils is friable and easy to till except in eroded areas that have a high clay content. The surface layer of the Carbo soils has a high clay content and is difficult to till. The subsoil of both soils has a high shrink-swell potential. The thickness of the root zone and depth to bedrock are more than 60 inches in the Oaklet soils and are 20 to 40 inches in the Carbo soils.

Both soils have high natural fertility and low organic matter content. The surface layer and upper part of the subsoil of the Oaklet soils range from very strongly acid through slightly acid unless lime has been applied, and the lower part of the subsoil ranges from strongly acid through moderately alkaline. The surface layer and upper part of the subsoil of the Carbo soils range from very strongly acid through neutral unless lime has been applied, and the lower part of the subsoil ranges from medium acid through mildly alkaline.

Most areas of this complex are used for cultivated crops or pasture. A small acreage is in orchards and woodland.

This Oaklet-Carbo complex is moderately well suited to cultivated crops. Outcrops of limestone bedrock interfere with seedbed preparation and cultivating and harvesting operations. The low available water capacity in the Carbo soils also limits crop yields. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is fair to poor but can be improved and maintained by incorporating organic matter into the soils and by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This complex is moderately well suited to fruits, nuts, and berries. Poor air drainage is a major limitation in some areas. Also, rock outcrops interfere with some types of machinery. Yields can be increased by applying lime and fertilizer.

This complex is well suited to pasture; however, rock outcrops limit the use of equipment for mowing and controlling weeds. The low available water capacity in the Carbo soils limits crop yields. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Oaklet soils for trees is high, and that of the Carbo soils is moderately high. The high content of clay in both soils limits the use of heavy timber equipment, especially during periods of extreme wetness.

The slow permeability, high clay content, high shrink-swell potential, and low strength in both soils and depth to bedrock in the Carbo soils limit the use of this complex for septic tank absorption fields, sewage lagoons, sanitary landfills, shallow excavations, dwellings, small commercial buildings, roads and streets, and some types of recreation. Sinkholes and solution channels in the bedrock increase the hazard of

contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields. Rock outcrops limit the use of this complex for lawns and landscaping.

This Oaklet-Carbo complex is in capability subclass IIe.

33B—Pagebrook silty clay loam, 0 to 7 percent slopes. This nearly level to gently sloping soil is deep and moderately well drained. It is on broad intermittent drainageways in the Shenandoah Valley. Slopes are smooth and about 200 to 1,000 feet long. Areas of this soil are long and winding and range from about 10 to 100 acres.

Typically, the surface layer of this Pagebrook soil is dark yellowish brown silty clay loam about 8 inches thick. The subsoil extends to a depth of 57 inches. It is mainly dark brown clay in the upper part and yellowish brown clay with light gray and light olive brown mottles in the lower part. The substratum extends to a depth of 92 inches. It is yellowish brown clay with pale brown, light gray, and pale yellow mottles. The clay in the subsoil and substratum is firm, sticky, and plastic. Hard limestone bedrock is at a depth of 92 inches.

Included with this soil in mapping are small intermingled areas of the Hollywood, McGary, Timberville, and Weaver soils. The Hollywood, McGary, and Weaver soils are in depressions, in slightly lower areas, and along drainageways. The Timberville soils are similar in location to the Pagebrook soils. Also included are areas of limestone rock outcrops and areas where the surface layer is clay. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Pagebrook soil is slow, and the available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The surface layer and subsoil have a high clay content and high shrink-swell potential. Deep, wide cracks form in the surface layer when the soil is dry, and water enters rapidly; however, when the moisture content is high, the soil expands, closing the cracks and causing small mounds and swales to form on the surface. The thickness of the rooting depth and depth to bedrock are more than 60 inches.

The soil has high natural fertility and moderate organic matter content. It ranges from strongly acid through mildly alkaline in the surface layer and upper part of the subsoil and from slightly acid through moderately alkaline in the lower part of the subsoil and in the substratum. A seasonal high water table is at a depth of 2 to 4 feet from December through March. The soil is frequently flooded for very brief periods by runoff from higher slopes.

Areas of this soil are mostly in pasture. A small acreage is in woodland, and a small acreage is used for cultivated crops.

This Pagebrook soil is poorly suited to cultivated crops. The high clay content of the surface layer and the substratum severely restricts tillage and machinery operations. Conservation tillage reduces the effects of this high clay content. Crop yields can be increased by applying fertilizer, but lime is generally not needed.

This soil is poorly suited to fruits, nuts, and berries. Poor air drainage causes freezing of fruit buds, and the high clay content of this soil limits equipment operation.

This soil is moderately well suited to pasture. Weed control is a major concern, because the high clay content of this soil limits the use of equipment. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Pagebrook soil for trees is moderately high; however, the high clay content restricts seedling survival and growth. Use of heavy timber equipment is limited, especially during wet periods.

Flooding, slow permeability, high clay content, and high shrink-swell potential are the main limitations to use of this soil for septic tank absorption fields, sanitary landfills, shallow excavations, dwellings, small commercial buildings, and roads and streets. These limitations also affect most types of recreation.

This Pagebrook soil is in capability subclass IIIe.

34—Pits, sand and gravel. This map unit consists mainly of open excavations from which sand, gravel, or marl have been removed. These Pits are mostly along small streams in the Shenandoah Valley. The excavations range from 5 to 20 feet deep and have steep side slopes and a nearly level floor. Areas of these Pits are mainly oval and range from about 5 to 30 acres. Water is ponded in many areas, and in some areas streams flow into the pits and form relatively large ponds.

Included with this unit in mapping are small intermingled, unexcavated areas of the Buckton and Weaver soils and Udipsamments. Also included is spoil from many of the pits. Some included areas have been partially filled and are used as dumps. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this map unit varies, but is mostly moderate or moderately rapid. Surface runoff is generally slow. The material remaining in the bottom and on the sides of most pits is mainly moderately alkaline. Most areas are frequently flooded for brief periods.

The flood hazard, wetness, and moderately alkaline reaction generally make this map unit unsuitable for farming, woodland, or community development. A hazard of ground water pollution limits the use of this unit for waste disposal. Onsite investigation is needed to determine the suitability of the unit for most uses and to determine the feasibility of reclamation.

Pits, sand and gravel, have not been assigned a capability subclass.

35B—Poplimento silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on narrow and broad ridges in the Shenandoah Valley. Slopes are smooth and about 200 to 1,000 feet long. Areas of this soil are long and winding and range from about 5 to 150 acres.

Typically, the surface layer of this Poplimento soil is dark yellowish brown silt loam about 9 inches thick. The subsoil extends to a depth of 58 inches. It is strong brown silty clay loam in the upper part, strong brown clay in the middle part, and strong brown shaly silty clay in the lower part. The substratum is strong brown shaly silty clay to a depth of at least 73 inches.

Included with this soil in mapping are small intermingled areas of the Duffield, Hagerstown, Nicholson, and Timberville soils. The Duffield and Nicholson soils are on ridges, in heads of drainageways, and in saddles. The Hagerstown soils are similar in location to the Poplimento soils. The Timberville soils are in depressions and along narrow drainageways. Also included are scattered outcrops of limestone bedrock that are generally more than 300 feet apart, soils with a cherty surface layer, and severely eroded soils with a clay surface layer. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Poplimento soil is moderately slow, and the available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer is friable and easy to till, and the subsoil has a high shrink-swell potential. The thickness of the root zone and depth to bedrock are more than 48 inches. The soil has medium natural fertility and low organic matter content. The surface layer and upper part of the subsoil range from very strongly acid through medium acid unless lime has been applied. The lower part of the subsoil and the substratum range from strongly acid through slightly acid.

Most areas of this soil are used for cultivated crops or pasture. A large acreage is in orchards, and the remainder is in woodland.

This Poplimento soil is well suited to cultivated crops. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is fair, but it can be improved and maintained by incorporating organic matter into the soil and by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This soil is well suited to fruits, nuts, and berries if air drainage is adequate. Yields can be increased by applying lime and fertilizer.

This soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Poplimento soil for trees is high. The high clay content limits the use of timber equipment, especially during periods of extreme wetness.

The high clay content, low soil strength, high shrink-swell potential, depth to bedrock, and moderately slow permeability in the subsoil are the main limitations to use of this Poplimento soil for sanitary facilities, buildings, local roads and streets, and most types of recreation. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields.

This Poplimento soil is in capability subclass IIe.

35C—Poplimento silt loam, 8 to 15 percent slopes. This sloping soil is deep and well drained. It is on side slopes in the Shenandoah Valley. Slopes are smooth and about 200 to 400 feet long. Areas of this soil are long and winding and range from about 5 to 25 acres.

Typically, the surface layer of this Poplimento soil is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of 47 inches. It is strong brown silty clay loam in the upper part, strong brown clay in the middle part, and strong brown shaly silty clay in the lower part. The substratum is strong brown shaly silty clay to a depth of at least 73 inches.

Included with this soil in mapping are small intermingled areas of the Duffield, Hagerstown, Nicholson, and Timberville soils. The Duffield and Nicholson soils are at higher elevations and in heads of drainageways. The Hagerstown soils are similar in location to the Poplimento soil. The Timberville soils are in depressions and along narrow drainageways. Also included are scattered outcrops of limestone bedrock that are generally more than 300 feet apart, soils with a cherty surface layer, and severely eroded soils with a clay surface layer. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Poplimento soil is moderately slow, and the available water capacity is moderate. Surface runoff is rapid. The erosion hazard is severe. The surface layer is friable and easy to till, and the subsoil has a high shrink-swell potential. The thickness of the root zone and depth to bedrock are more than 48 inches. The soil has medium natural fertility and low organic matter content. The surface layer and upper part of the subsoil range from very strongly acid through medium acid unless lime has been applied. The lower part of the subsoil and the substratum range from strongly acid through slightly acid.

Most areas of this soil are used for cultivated crops or pasture. A large acreage is in orchards, and the remainder is in woodland.

This Poplimento soil is well suited to cultivated crops. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is fair, but it

can be improved and maintained by incorporating organic matter into the soil and by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This soil is well suited to fruits, nuts, and berries if air drainage is adequate. Yields can be increased by applying lime and fertilizer.

This soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Poplimento soil for trees is high. The high clay content limits the use of timber equipment, especially during periods of extreme wetness.

The high clay content, low soil strength, high shrink-swell potential, depth to bedrock, slope, and moderately slow permeability in the subsoil are the main limitations to use of this Poplimento soil for sanitary facilities, buildings, local roads and streets, and most types of recreation. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields.

This Poplimento soil is in capability subclass IIIe.

36B—Poplimento silt loam, rocky, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on narrow and broad ridges in the Shenandoah Valley. Slopes are smooth and about 200 to 1,000 feet long. Areas of this soil are long and winding and range from about 5 to 150 acres. Outcrops of limestone bedrock are roughly 100 to 300 feet apart.

Typically, the surface layer of this Poplimento soil is dark yellowish brown silt loam about 9 inches thick. The subsoil extends to a depth of 58 inches. It is strong brown silty clay loam in the upper part, strong brown clay in the middle part, and strong brown shaly silty clay in the lower part. The substratum is strong brown shaly silty clay to a depth of at least 73 inches.

Included with this soil in mapping are small intermingled areas of the Duffield, Hagerstown, Nicholson, and Timberville soils. The Duffield and Nicholson soils are on ridges, in heads of drainageways, and in saddles. The Hagerstown soils are similar in location to the Poplimento soils. The Timberville soils are in depressions and along narrow drainageways. Also included are areas that do not have rock outcrops, soils with a cherty surface layer, and severely eroded soils with a clay surface layer. Areas of the included soils make up about 25 percent of this map unit.

The permeability of this Poplimento soil is moderately slow, and the available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer is friable and easy to till, and the subsoil has a high shrink-swell potential. The thickness of the root zone and depth to bedrock are more than 48 inches. The soil has medium natural fertility and low organic matter content. The surface layer and upper part of the subsoil range from very strongly acid through medium acid unless lime has been applied. The lower part of the subsoil and the substratum range from strongly acid through slightly acid.

Most areas of this soil are used for cultivated crops or pasture. A large acreage is in orchards, and the remainder is in woodland.

This Poplimento soil is moderately well suited to cultivated crops. Rock outcrops interfere with seedbed preparation and cultivating and harvesting operations. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is fair, but it can be improved and maintained by incorporating organic matter into the soil and by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This soil is well suited to fruits, nuts, and berries if air drainage is adequate. Yields can be increased by applying lime and fertilizer. Rock outcrops interfere with mowing and tree planting patterns. They cause skipped spaces in the tree planting patterns.

This soil is well suited to pasture, but rock outcrops interfere with mowing. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Poplimento soil for trees is high. The high clay content limits the use of timber equipment, especially during periods of extreme wetness.

The high clay content, low soil strength, high shrink-swell potential, depth to bedrock, rock outcrops, and moderately slow permeability in the subsoil are the main limitations to use of this Poplimento soil for sanitary facilities, buildings, local roads and streets, and most types of recreation. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields.

This Poplimento soil is in capability subclass IIe.

36C—Poplimento silt loam, rocky, 8 to 15 percent slopes. This sloping soil is deep and well drained. It is on narrow side slopes in the Shenandoah Valley. Slopes are smooth and about 200 to 400 feet long. Areas of this soil are long and winding and range from about 5 to 25 acres. Outcrops of limestone bedrock are roughly 100 to 300 feet apart.

Typically, the surface layer of this Poplimento soil is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of 47 inches. It is strong brown silty clay loam in the upper part, strong brown clay in the middle part, and strong brown shaly silty clay in

the lower part. The substratum is strong brown shaly silty clay to a depth of at least 73 inches.

Included with this soil in mapping are small intermingled areas of the Duffield, Hagerstown, Nicholson, and Timberville soils. The Duffield and Nicholson soils are at higher elevations and in heads of drainageways. The Hagerstown soils are similar in location to the Poplimento soils. The Timberville soils are in depressions and along narrow drainageways. Also included are areas that do not have rock outcrops, soils with a cherty surface layer, and severely eroded soils with a clay surface layer. Areas of the included soils make up about 25 percent of this map unit.

The permeability of this Poplimento soil is moderately slow, and the available water capacity is moderate. Surface runoff is rapid. The erosion hazard is severe. The surface layer is friable and easy to till, and the subsoil has a high shrink-swell potential. The thickness of the root zone and depth to bedrock are more than 48 inches. The soil has medium natural fertility and low organic matter content. The surface layer and upper part of the subsoil range from very strongly acid through medium acid unless lime has been applied. The lower part of the subsoil and the substratum range from strongly acid through slightly acid.

Most areas of this soil are used for cultivated crops or pasture. A large acreage is in orchards, and the remainder is in woodland.

This Poplimento soil is moderately well suited to cultivated crops. Rock outcrops interfere with seedbed preparation and cultivating and harvesting operations. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is fair, but it can be improved and maintained by incorporating organic matter into the soil and by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This soil is well suited to fruits, nuts, and berries if air drainage is adequate. Yields can be increased by applying lime and fertilizer. Rock outcrops interfere with mowing and tree planting. They cause skipped spaces in the tree planting patterns.

This soil is well suited to pasture, but rock outcrops interfere with mowing. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Poplimento soil for trees is high. The high clay content limits the use of timber equipment, especially during periods of extreme wetness.

The high clay content, low soil strength, high shrink-swell potential, depth to bedrock, rock outcrops, slope, and moderately slow permeability in the subsoil are the main limitations to use of this Poplimento soil for sanitary facilities, buildings, local roads and streets, and most types of recreation. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields.

This Poplimento soil is in capability subclass IIIe.

37B—Poplimento-Rock outcrop complex, 3 to 15 percent slopes. This undulating to rolling complex consists of deep and well drained Poplimento soils and outcrops of limestone bedrock. This map unit is on narrow and broad ridges and side slopes in the Shenandoah Valley. The soils are so intermingled that it was not practical to map them separately. This map unit is about 55 percent Poplimento soils, 25 percent Rock outcrop, and 20 percent other soils. Slopes are rough and complex, and they are about 200 to 800 feet long. Areas of this complex are long and winding and range from about 5 to 100 acres. Rock outcrops are roughly 10 to 100 feet apart.

Typically, the surface layer of the Poplimento soil is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of 47 inches. It is strong brown silty clay loam in the upper part, strong brown clay in the middle part, and strong brown shaly silty clay in the lower part. The substratum is strong brown shaly silty clay to a depth of at least 73 inches.

Included with this complex in mapping are small intermingled areas of the Duffield, Hagerstown, Nicholson, Opequon, and Timberville soils. The Duffield and Nicholson soils are on ridges, in heads of drainageways, and in saddles. The Hagerstown soils are similar in location to the Poplimento soils. The Opequon soils are near rock outcrops. The Timberville soils are in depressions and along narrow drainageways. Also included are areas that do not have rock outcrops, soils with a cherty surface layer, and severely eroded soils with a clay surface layer.

The permeability of the Poplimento soils is moderately slow, and the available water capacity is moderate. Surface runoff is medium on the lower slopes and rapid on the steeper slopes. The erosion hazard is moderate to severe. The surface layer is friable, and the subsoil has a high shrink-swell potential. The thickness of the root zone and depth to bedrock are more than 48 inches. The soils have medium natural fertility and low organic matter content. The surface layer and upper part of the subsoil range from very strongly acid through medium acid unless lime has been applied. The lower part of the subsoil and the substratum range from strongly acid through slightly acid.

Most areas of these soils are used for pasture. The remaining areas are in woodland.

This Poplimento-Rock outcrop complex is not suited to cultivated crops and is poorly suited to fruits, nuts, and berries. The prevalence of Rock outcrop makes use of machinery for seedbed preparation and for the cultivating and harvesting of crops impracticable. Rock

outcrop interferes with spraying and weed-control equipment in orchards. It also causes skipped spaces in the tree planting patterns.

This complex is moderately well suited to pasture. Rock outcrop limits the use of all but light machinery and hand tools to improve pasture and control weeds. Rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of these Poplimento soils for trees is high. The high clay content limits the use of timber equipment, especially during periods of extreme wetness, and Rock outcrop interferes with equipment used to harvest timber.

The high clay content, low soil strength, high shrink-swell potential, slope, depth to bedrock, closely spaced rock outcrops, and moderately slow permeability in the subsoil are the main limitations to use of this Poplimento-Rock outcrop complex for sanitary facilities, buildings, local roads and streets, and most types of recreation. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields.

This Poplimento-Rock outcrop complex is in capability subclass VIs.

38B—Poplimento-Webbtown complex, 3 to 8 percent slopes. This complex consists of deep Poplimento soils and moderately deep Webbtown soils. These soils are undulating and well drained and are on broad ridges in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. This map unit is about 45 percent Poplimento soils, 35 percent Webbtown soils, and 20 percent other soils. Slopes are complex and about 200 to 900 feet long. Areas of this complex are long and winding and range from about 2 to 150 acres.

Typically, the surface layer of the Poplimento soil is dark yellowish brown silt loam about 9 inches thick. The subsoil extends to a depth of 58 inches. It is strong brown silty clay loam in the upper part, strong brown clay in the middle part, and strong brown shaly silty clay in the lower part. The substratum is strong brown shaly silty clay to a depth of at least 73 inches.

Typically, the surface layer of the Webbtown soil is brown shaly silt loam about 8 inches thick. The subsoil extends to a depth of 50 inches. It is brown shaly silt loam in the upper part, strong brown shaly silty clay loam in the middle part, and yellowish red shaly silty clay that is sticky and plastic in the lower part. The substratum is strong brown very shaly silt loam to a depth of 60 inches and is mottled red, brown, and yellow very shaly silty clay to a depth of at least 72 inches.

Included with these soils in mapping are small intermingled areas of the Braddock, Duffield, Monongahela, Nicholson, and Timberville soils. The Braddock and Monongahela soils are similar in location to the Poplimento and Webbtown soils. The Duffield and Nicholson soils are in saddles, in depressions, and on ridges. The Timberville soils are in heads of drainageways, along narrow drainageways, and in depressions. Also included are severely eroded soils with a silty clay loam or silty clay surface layer.

The permeability of the Poplimento and Webbtown soils is moderately slow, and the available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer of both soils is friable, but the Webbtown soils have a high content of shale. The shrink-swell potential of the subsoil is high in the Poplimento soils, and that of the Webbtown soils is moderate. The thickness of the root zone and depth to bedrock are more than 48 inches in the Poplimento soils and more than 30 inches in the Webbtown soils. Depth to bedrock is extremely variable over short distances in both soils. Both soils have medium natural fertility and low organic matter content. Unless lime has been applied, the surface layer and upper part of the subsoil range from very strongly acid through medium acid in the Poplimento soils and from strongly acid through slightly acid in the Webbtown soils. The lower part of the subsoil and the substratum range from strongly acid through slightly acid in the Poplimento soils and from medium acid through neutral in the Webbtown soils.

Most areas of this complex are used for cultivated crops or pasture. A large acreage is in orchards, and the remainder is in woodland.

This Poplimento-Webbtown complex is well suited to cultivated crops. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is good, but it can be improved and maintained by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This complex is well suited to fruits, nuts, and berries if air drainage is adequate. Yields can be increased by applying lime and fertilizer.

This complex is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Poplimento soils for trees is high, and that of the Webbtown soils is moderate. The high clay content of the Poplimento soils limits the use of timber equipment, especially during periods of extreme wetness. Also, the high shale content in the Webbtown soils limits seedling survival and growth.

Moderately slow permeability, low soil strength, the moderate depth to bedrock of the Webbtown soils, and the high clay content and high shrink-swell potential of the Poplimento soils limit the use of this complex for sanitary facilities, buildings, local roads and streets, and most types of recreation. The large number of shale

fragments on the surface of the Webbtown soils also limits their use for lawns or golf fairways and for most types of recreation.

This Poplimento-Webbtown complex is in capability subclass IIe.

38C—Poplimento-Webbtown complex, 8 to 15 percent slopes. This complex consists of deep Poplimento soils and moderately deep Webbtown soils. These soils are rolling and well drained and are on narrow side slopes in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. This map unit is about 45 percent Poplimento soils, 35 percent Webbtown soils, and 20 percent other soils. Slopes are complex and about 200 to 500 feet long. Areas of this complex are long and winding and range from about 2 to 40 acres.

Typically, the surface layer of the Poplimento soil is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of 47 inches. It is strong brown silty clay loam in the upper part, strong brown clay in the middle part, and strong brown shaly silty clay in the lower part. The substratum is strong brown shaly silty clay to a depth of at least 73 inches.

Typically, the surface layer of the Webbtown soil is brown shaly silt loam about 6 inches thick. The subsoil extends to a depth of 43 inches. It is brown shaly silt loam in the upper part, strong brown shaly silty clay loam in the middle part, and yellowish red shaly silty clay that is sticky and plastic in the lower part. The substratum is strong brown very shaly silt loam to a depth of 57 inches and is mottled red, brown, and yellow very shaly silty clay to a depth of at least 72 inches.

Included with these soils in mapping are small intermingled areas of the Braddock, Duffield, Monongahela, Nicholson, and Timberville soils. The Braddock and Monongahela soils are on higher parts of the side slope. The Duffield and Nicholson soils are in saddles, in depressions, and in heads of drainageways. The Timberville soils are in heads of drainageways, along narrow drainageways, and in depressions. Also included are severely eroded soils with a silty clay loam or silty clay surface layer.

The permeability of the Poplimento and Webbtown soils is moderately slow, and the available water capacity is moderate. Surface runoff is rapid. The erosion hazard is severe. The surface layer of both soils is friable, but the Webbtown soils have a high content of shale. The shrink-swell potential of the subsoil is high in the Poplimento soils, and that of the Webbtown soils is moderate. The thickness of the root zone and depth to bedrock are more than 48 inches in the Poplimento soils and more than 30 inches in the Webbtown soils. Depth to bedrock is extremely variable over short distances in both soils. Both soils have medium natural fertility and low organic matter content. Unless lime has been applied, the surface layer and upper part of the subsoil range from very strongly acid through medium acid in the Poplimento soils and from strongly acid through slightly acid in the Webbtown soils. The lower part of the subsoil and the substratum range from strongly acid through slightly acid in the Poplimento soils and from medium acid through neutral in the Webbtown soils.

Most areas of this complex are used for cultivated crops or pasture. A large acreage is in orchards, and the remainder is in woodland.

This Poplimento-Webbtown complex is moderately well suited to cultivated crops. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is good, but it can be improved and maintained by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This complex is well suited to fruits, nuts, and berries if air drainage is adequate. Yields can be increased by applying lime and fertilizer.

This complex is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Poplimento soils for trees is high, and that of the Webbtown soils is moderate. The high clay content of the Poplimento soils limits the use of timber equipment, especially during periods of extreme wetness. Also, the high shale content in the Webbtown soils limits seedling survival and growth.

Moderately slow permeability, slope, low soil strength, the moderate depth to bedrock of the Webbtown soils, and the high clay content and high shrink-swell potential of the Poplimento soils limit the use of this complex for sanitary facilities, buildings, local roads and streets, and most types of recreation. The large number of shale fragments on the surface of the Webbtown soils also limits their use for lawns or golf fairways and for most types of recreation.

This Poplimento-Webbtown complex is in capability subclass IIIe.

38D2—Poplimento-Webbtown complex, 15 to 30 percent slopes, eroded. This complex consists of deep Poplimento soils and moderately deep Webbtown soils. These soils are steep and well drained and are on narrow side slopes in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. This map unit is about 40 percent Poplimento soils, 35 percent Webbtown soils, and 25 percent other soils. Slopes are rough and complex and are about 200 to 500 feet long. Areas of this complex are long and winding and range from about 2 to 30 acres.

Typically, the surface layer of the Poplimento soil is dark yellowish brown silt loam about 5 inches thick. The subsoil extends to a depth of 41 inches. It is strong

brown silty clay loam in the upper part, strong brown clay in the middle part, and strong brown shaly silty clay in the lower part. The substratum is strong brown shaly silty clay to a depth of at least 73 inches.

Typically, the surface layer of the Webbtown soil is brown shaly silt loam about 5 inches thick. The subsoil extends to a depth of 38 inches. It is brown shaly silt loam in the upper part, strong brown shaly silty clay loam in the middle part, and yellowish red shaly silty clay that is sticky and plastic in the lower part. The substratum is strong brown very shaly silt loam to a depth of 49 inches and is mottled red, brown, and yellow very shaly silty clay to a depth of at least 72 inches.

Included with these soils in mapping are small intermingled areas of the Braddock, Monongahela, Pagebrook, Timberville, and Weaver soils. The Braddock and Monongahela soils are on higher parts of the side slope. The Pagebrook and Weaver soils are along narrow drainageways and on foot slopes. The Timberville soils are in heads of drainageways, along narrow intermittent drainageways, in saddles, and in depressions. Also included are severely eroded soils with a silty clay loam or silty clay surface layer.

The permeability of the Poplimento and Webbtown soils is moderately slow, and the available water capacity is moderate. Surface runoff is very rapid. The erosion hazard is severe. The surface layer of both soils is friable, but the Webbtown soils have a high content of shale. The shrink-swell potential of the subsoil is high in the Poplimento soils, and that of the Webbtown soils is moderate. The thickness of the root zone and depth to bedrock are more than 48 inches in the Poplimento soils and more than 30 inches in the Webbtown soils. Depth to bedrock is extremely variable over short distances in both soils. Both soils have medium natural fertility and low organic matter content. Unless lime has been applied, the surface layer and upper part of the subsoil range from very strongly acid through medium acid in the Poplimento soils and from strongly acid through slightly acid in the Webbtown soils. The lower part of the subsoil and the substratum range from strongly acid through slightly acid in the Poplimento soils and from medium acid through neutral in the Webbtown soils.

Most areas of this complex are used for pasture. A large acreage is in orchards, and the remainder is in woodland.

This Poplimento-Webbtown complex is poorly suited to cultivated crops. Slope limits the use of machinery. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is good, but it can be improved and maintained by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This complex is moderately well suited to fruits, nuts, and berries if air drainage is adequate, although slope limits the use of machinery. Yields can be increased by applying lime and fertilizer.

This complex is moderately well suited to pasture. Slope limits the use of machinery. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Poplimento soils for trees is high, and that of the Webbtown soils is moderate. The high clay content of the Poplimento soils and steep slopes of the Webbtown soils limit the use of timber equipment, however, especially during periods of extreme wetness. The high shale content in the Webbtown soils limits seedling survival and growth.

Moderately slow permeability, slope, low soil strength, the moderate depth to bedrock of the Webbtown soils and the high clay content and high shrink-swell potential of the Poplimento soils limit the use of this complex for sanitary facilities, buildings, local roads and streets, and most types of recreation. The large number of shale fragments on the surface of the Webbtown soils also limits their use for lawns or golf fairways and for most types of recreation.

This Poplimento-Webbtown complex is in capability subclass IVe.

39B—Poplimento-Webbtown complex, rocky, 3 to 8 percent slopes. This complex consists of deep Poplimento soils and moderately deep Webbtown soils. The soils are undulating and well drained and are on broad ridges in the Shenandoah Valley. These soils are so intermingled that it was not practical to map them separately. This map unit is about 45 percent Poplimento soils, 35 percent Webbtown soils, and 20 percent other soils. Slopes are complex and about 200 to 1,000 feet long. Areas of this complex are long and winding and range from about 2 to 150 acres. Outcrops of limestone, shale, siltstone, or sandstone are roughly 100 to 300 feet apart.

Typically, the surface layer of the Poplimento soil is dark yellowish brown silt loam about 9 inches thick. The subsoil extends to a depth of 58 inches. It is strong brown silty clay loam in the upper part, strong brown clay in the middle part, and strong brown shaly silty clay in the lower part. The substratum is strong brown shaly silty clay to a depth of at least 73 inches.

Typically, the surface layer of the Webbtown soil is brown shaly silt loam about 8 inches thick. The subsoil extends to a depth of 50 inches. It is brown shaly silt loam in the upper part, strong brown shaly silty clay loam in the middle part, and yellowish red shaly silty clay that is sticky and plastic in the lower part. The substratum is strong brown very shaly silt loam to a depth of 60 inches and is mottled red, brown, and yellow very shaly silty clay to a depth of at least 72 inches.

Included with these soils in mapping are small intermingled areas of the Braddock, Duffield, Monongahela, Nicholson, and Timberville soils. The Braddock and Monongahela soils are similar in location to the Poplimento and Webbtown soils. The Duffield and Nicholson soils are in saddles, in depressions, and on ridges. The Timberville soils are in heads of drainageways, along narrow drainageways, and in depressions. Also included are severely eroded soils with a silty clay loam or silty clay surface layer.

The permeability of the Poplimento and Webbtown soils is moderately slow, and the available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer of both soils is friable, but the Webbtown soils have a high content of shale. The shrink-swell potential of the subsoil is high in the Poplimento soils, and that of the Webbtown soils is moderate. The thickness of the root zone and depth to bedrock are more than 48 inches in the Poplimento soils and more than 30 inches in the Webbtown soils. Depth to bedrock is extremely variable over short distances in both soils. Both soils have medium natural fertility and low organic matter content. Unless lime has been applied, the surface layer and upper part of the subsoil range from very strongly acid through medium acid in the Poplimento soils and from strongly acid through slightly acid in the Webbtown soils. The lower part of the subsoil and the substratum range from strongly acid through slightly acid in the Poplimento soils and from medium acid through neutral in the Webbtown soils.

Most areas of this complex are used for cultivated crops or pasture. A large acreage is in orchards, and the remainder is in woodland.

This Poplimento-Webbtown complex is moderately well suited to cultivated crops. Rock outcrops interfere with seedbed preparation and cultivating and harvesting operations. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is good, but it can be improved and maintained by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This complex is well suited to fruits, nuts, and berries if air drainage is adequate. Yields can be increased by applying lime and fertilizer. Rock outcrops interfere with mowing to control weeds.

This complex is well suited to pasture; however, rock outcrops interfere with mowing. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Poplimento soils for trees is high, and that of the Webbtown soils is moderate. The high clay content of Poplimento soils limits the use of timber equipment, especially during periods of extreme wetness. The high shale content in the Webbtown soils limits seedling survival and growth.

Moderately slow permeability, rock outcrops, low soil strength, the moderate depth to bedrock of the Webbtown soils, and the high clay content and high shrink-swell potential of the Poplimento soils limit the use of this complex for sanitary facilities, buildings, local roads and streets, and most types of recreation. The large number of shale fragments on the surface of the Webbtown soils also limits their use for lawns or golf fairways and for most types of recreation.

This Poplimento-Webbtown complex is in capability subclass IIe.

39C—Poplimento-Webbtown complex, rocky, 8 to 15 percent slopes. This complex consists of deep Poplimento soils and moderately deep Webbtown sols. The soils are rolling and well drained and are on narrow side slopes in the Shenandoah Valley. These soils are so intermingled that is was not practical to map them separately. This map unit is about 45 percent Poplimento soils, 35 percent Webbtown soils, and 20 percent other soils. Slopes are complex and about 200 to 500 feet long. Areas of this complex are long and winding and range from 2 to 40 acres. Outcrops of limestone, shale, siltstone, or sandstone are roughly 100 to 300 feet apart.

Typically, the surface layer of the Poplimento soil is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of 47 inches. It is strong brown silty clay loam in the upper part, strong brown clay in the middle part, and strong brown shaly silty clay in the lower part. The substratum is strong brown shaly silty clay to a depth of at least 73 inches.

Typically, the surface layer of the Webbtown soil is brown shaly silt loam about 6 inches thick. The subsoil extends to a depth of 43 inches. It is brown shaly silt loam in the upper part, strong brown shaly silty clay loam in the middle part, and yellowish red shaly silty clay that is sticky and plastic in the lower part. The substratum is strong brown very shaly silt loam to a depth of 57 inches and is mottled red, brown, and yellow very shaly silty clay to a depth of at least 72 inches.

Included with these soils in mapping are small intermingled areas of the Braddock, Duffield, Monongahela, Nicholson, and Timberville soils. The Braddock and Monongahela soils are on higher parts of the side slopes. The Duffield and Nicholson soils are in saddles, in depressions, and in heads of drainageways. The Timberville soils are in heads of drainageways, along narrow drainageways, and in depressions. Also included are severely eroded soils with a silty clay loam or silty clay surface layer.

The permeability of the Poplimento and Webbtown soils is moderately slow, and the available water capacity is moderate. Surface runoff is rapid. The erosion hazard is severe. The surface layer of both soils is friable, but the Webbtown soils have a high content of shale. The

shrink-swell potential of the subsoil is high in the Poplimento soils, and that of the Webbtown soils is moderate. The thickness of the root zone and depth to bedrock are more than 48 inches in the Poplimento soils and more than 30 inches in the Webbtown soils. Depth to bedrock is extremely variable over short distances in both soils. Both soils have medium natural fertility and low organic matter content. Unless lime has been applied, the surface layer and upper part of the subsoil range from very strongly acid through medium acid in the Poplimento soils and from strongly acid through slightly acid in the Webbtown soils. The lower part of the subsoil and the substratum range from strongly acid through slighty acid in the Poplimento soils and from medium acid through neutral in the Webbtown soils.

Most areas of this complex are used for cultivated crops or pasture. A large acreage is in orchards, and the remainder is in woodland.

This Poplimento-Webbtown complex is moderately well suited to cultivated crops. Rock outcrops interfere with seedbed preparation and cultivating and harvesting operations. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is good, but it can be improved and maintained by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This complex is well suited to fruits, nuts, and berries if air drainage is adequate. Yields can be increased by applying lime and fertilizer. Rock outcrops interfere with mowing to control weeds.

This complex is well suited to pasture; however, rock outcrops interfere with mowing. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Poplimento soils for trees is high, and that of the Webbtown soils is moderate. The high clay content of the Poplimento soils limits the use of timber equipment, especially during periods of extreme wetness. The high shale content of the Webbtown soils limits seedling survival and growth.

Moderately slow permeability, slope, rock outcrops, low soil strength, the moderate depth to bedrock of the Webbtown soils, and the high clay content and high shrink-swell potential of the Poplimento soils limit the use of this complex for sanitary facilities, buildings, local roads and streets, and most types of recreation. The large number of shale fragments on the surface of the Webbtown soils also limits their use for lawns or golf fairways and most most types of recreation.

This Poplimento-Webbtown complex is in capability subclass IIIe.

39D2—Poplimento-Webbtown complex, rocky, 15 to 35 percent slopes, eroded. This complex consists of deep Poplimento soils and moderately deep Webbtown soils. The soils are hilly to steep and well drained, and they are on narrow side slopes in the Shenandoah Valley. These soils are so intermingled that it was not practical to map them separately. This map unit is about 40 percent Poplimento soils, 35 percent Webbtown soils, and 25 percent other soils. Slopes are rough and complex and are about 200 to 500 feet long. Areas of this complex are long and winding and range from about 2 to 30 acres. Outcrops of limestone, shale, siltstone, or sandstone are roughly 100 to 300 feet apart.

Typically, the surface layer of this Poplimento soil is dark yellowish brown silt loam about 5 inches thick. The subsoil extends to a depth of 41 inches. It is strong brown silty clay loam in the upper part, strong brown clay in the middle part, and strong brown shaly silty clay in the lower part. The substratum is strong brown shaly silty clay to a depth of at least 73 inches.

Typically, the surface layer of this Webbtown soil is brown shaly silt loam about 5 inches thick. The subsoil extends to a depth of 38 inches. It is brown shaly silt loam in the upper part, strong brown shaly silty clay loam in the middle part, and yellowish red shaly silty clay that is sticky and plastic in the lower part. The substratum is strong brown very shaly silt loam to a depth of 49 inches and is mottled red, brown, and yellow very shaly silty clay to a depth of at least 72 inches.

Included with these soils in mapping are small intermingled areas of the Braddock, Monongahela, Pagebrook, Timberville, and Weaver soils. The Braddock and Monongahela soils are on higher parts of the side slope. The Pagebrook and Weaver soils are along narrow drainageways and on foot slopes. The Timberville soils are in heads of drainageways, along narrow drainageways, in saddles, and in depressions. Also included are severely eroded soils with a silty clay loam or silty clay surface layer.

The permeability of the Poplimento and Webbtown soils is moderately slow, and the available water capacity is moderate. Surface runoff is very rapid. The erosion hazard is severe. The surface layer of both soils is friable, but the Webbtown soils have a high content of shale. The shrink-swell potential of the subsoil is high in the Poplimento soils, and that of the Webbtown soils is moderate. The thickness of the root zone and depth to bedrock are more than 48 inches in the Poplimento soils and more than 30 inches in the Webbtown soils. Depth to bedrock is extremely variable over short distances in both soils. Both soils have medium natural fertility and low organic matter content. Unless lime has been applied, the surface layer and upper part of the subsoil range from very strongly acid through medium acid in the Poplimento soils and from strongly acid through slightly acid in the Webbtown soils. The lower part of the subsoil and the substratum range from strongly acid through slightly acid in the Poplimento soils and from medium acid through neutral in the Webbtown soils.

Most areas of this complex are used for pasture. A small acreage is in orchards, and the remainder is in woodland.

This Poplimento-Webbtown complex is not suited to cultivated crops. Slope and the large number of rock outcrops make the use of machinery for seedbed preparation and for the cultivating and harvesting of crops impractical.

This complex is moderately well suited to fruits, nuts, and berries if air drainage is adequate; however, rock outcrops interfere with the use of equipment for spraying and weed control. They also cause skipped areas in the tree planting patterns. Yields can be increased by applying lime and fertilizer.

This complex is moderately well suited to pasture, although rock outcrops interfere with mowing to control weeds. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of these Poplimento soils for trees is high, and that of the Webbtown soils is moderate. The high clay content of the Poplimento soils and the steep slopes of both soils limit the use of timber equipment, especially during periods of extreme wetness. The high shale content of the Webbtown soils limits seedling survival and growth.

Moderately slow permeability, slope, rock outcrops, low soil strength, the moderate depth to bedrock of the Webbtown soils, and the high clay content and high shrink-swell potential of the Poplimento soils limit the use of this complex for sanitary facilities, buildings, local roads and streets, and most types of recreation. The large number of shale fragments on the surface of the Webbtown soils also limits their use for lawns or golf fairways and for most types of recreation.

This Poplimento-Webbtown complex is in capability subclass VIe.

40—Quarries-Dumps complex. This unit consists of open excavations and associated dumps in areas of the Shenandoah Valley that have been quarried for agricultural lime. These areas are mainly underlain by high-grade limestone. This complex is about 55 percent Quarries, 25 percent Dumps, and 20 percent other soils. The Quarries range from 10 to 50 feet or more deep and generally have vertical walls. The Dumps include the overburden of soil material, weathered rock fragments, and other debris deposited around the quarries during excavation. Areas of this complex are oval to irregularly shaped and range from about 10 to 30 acres. Some abandoned quarries have filled with water.

Included in mapping are small intermingled areas of the Carbo, Hagerstown, Oaklet, Opequon, and Swimley soils that have not been disturbed.

Reaction of the complex is moderately alkaline. Little or no vegetation grows in the Quarries, and major reclamation is needed before desirable plants can be grown on the Dumps. Onsite investigation is needed to determine the suitability of the unit for most uses and to determine whether it is feasible to reclaim the site.

This Quarries-Dumps complex has not been assigned a capability subclass.

41C—Rock outcrop-Catoctin complex, 3 to 45 percent slopes. This complex consists of outcrops of bedrock so intermingled with moderately deep, well drained, undulating to very steep Catoctin soils that it was not practical to map them separately. This map unit is on moderately broad ridges, mainly along the crest of the Blue Ridge Mountains. Slopes are rough and complex and about 200 to 500 feet long. Areas of this complex are generally oval and range from about 5 to 15 acres. The unit is about 55 percent Rock outcrop, 25 percent Catoctin soils, and 20 percent other soils. Rock outcrops are generally less than 10 feet apart and range in height from a few inches to 20 feet or more.

Typically, the surface layer of the Catoctin soil is brown cobbly silt loam about 6 inches thick. The subsoil extends to a depth of 20 inches. It is yellowish brown channery silt loam in the upper part and strong brown channery silt loam interrupted by lenses and pockets of silty clay loam in the lower part. The substratum is mottled yellowish brown very channery silt loam. Hard greenstone bedrock is at a depth of 29 inches.

Included with this complex in mapping are small areas of the Myersville and Lew soils. The Myersville soils are in large areas between the rock outcrops. The Lew soils are in concave heads of drainageways and in depressions.

The permeability of this Catoctin soil is moderately rapid, and the available water capacity is low. Surface runoff is medium to very rapid. The erosion hazard is severe. The surface layer and subsoil have a high content of coarse fragments. The subsoil has a low shrink-swell potential. The thickness of the root zone and depth to bedrock are 20 to 40 inches. The soil has medium natural fertility and moderate organic matter content. The surface layer and subsoil range from strongly acid through slightly acid, and the substratum ranges from medium acid through neutral.

Most areas of this complex are in woodland. The potential of the Catoctin soils for trees is moderate. Seedling survival and growth are limited by the available water capacity and depth to bedrock. The steeper slopes and the large amount of Rock outcrop limit the use of equipment on this complex.

Rock outcrop, slope, and depth to bedrock in the Catoctin soils severely limit most uses of this complex other than for woodland and wildlife habitat.

This Rock outcrop-Catoctin complex is in capability subclass VIIs.

42C—Rock outcrop-Dekalb complex, 3 to 45 percent slopes. This complex consists of outcrops of bedrock so intermingled with moderately deep, well drained, undulating to very steep Dekalb soils that it was not practical to map them separately. This map unit is on ridges and side slopes in the foothills of the Blue Ridge Mountains. Slopes are rough and complex and about 200 to 800 feet long. Areas of this complex are long and winding and range from about 5 to 80 acres. This complex is about 55 percent Rock outcrop, 25 percent Dekalb soils, and 20 percent other soils. The rock outcrops are generally less than 10 feet apart and range in height from a few inches to 10 feet or more.

Typically, the surface layer of this Dekalb soil is black flaggy sandy loam about 2 inches thick. The subsurface layer is brown channery sandy loam 6 inches thick. The subsoil is yellowish brown channery sandy loam to a depth of 25 inches. The substratum is yellowish brown very flaggy sandy loam. Hard sandstone bedrock is at a depth of 33 inches.

Included with this complex in mapping are small intermingled areas of the Cardiff, Hazleton, and Laidig soils. The Cardiff and Hazleton soils are between the rock outcrops. The Laidig soils are in heads of drainageways and in depressions.

The permeability of this DeKalb soil is moderately rapid, and the available water capacity is very low. Surface runoff is medium to very rapid. The erosion hazard is severe. The surface layer is very friable but has a high content of coarse fragments. The subsoil has a low shrink-swell potential. The thickness of the root zone and depth to hard sandstone and quartzite bedrock are 20 to 40 inches. The soil has low natural fertility and low organic matter content. It ranges from extremely acid through strongly acid.

Most areas of this complex are in woodland. The potential of the Dekalb soils for trees is moderate. Seedling survival and growth are limited by the very low available water capacity, acidity, and low natural fertility of the soil. The steeper slopes and the large amount of Rock outcrop limit the use of equipment on this complex.

Rock outcrop, slope, and depth to bedrock in the Dekalb soils limit most uses of this complex other than for woodland and wildlife habitat.

This Rock outcrop-Dekalb complex is in capability subclass VIIs.

43C—Rock outcrop-Opequon complex, 3 to 45 percent slopes. This undulating to very steep complex consists of outcrops of bedrock so intermingled with shallow, well drained Opequon soils that it was not practical to map them separately. The unit is on ridges and side slopes in the Shenandoah Valley. It is about 55 percent Rock outcrop, 25 percent Opequon soils, and 20 percent other soils. Slopes are rough and complex and about 200 to 2,500 feet long. Areas of this complex are long and winding to oval and range from about 5 to 30 acres. The rock outcrops are generally less than 10 feet apart and range in height from a few inches to 5 feet or more (fig. 5).

Typically, the surface layer of this Opequon soil is dark yellowish brown silty clay about 8 inches thick. The subsoil is brown clay that is firm, very sticky, and very plastic. Hard limestone bedrock is at a depth of 17 inches.

Included with this complex in mapping are small, intermingled areas of the Carbo, Hagerstown, Poplimento, Timberville, and Webbtown soils. The Carbo, Hagerstown, Poplimento, and Webbtown soils are between the rock outcrops. The Timberville soils are in depressions; along narrow, winding drainageways; and adjacent to sinkholes.

The permeability of this Opequon soil is moderately slow. The available water capacity is very low, and surface runoff is medium to very rapid. The erosion hazard is severe. The surface layer has a high clay content. The subsoil has a high shrink-swell potential. The thickness of the root zone and depth to bedrock are 12 to 20 inches. The soil has high natural fertility and a low organic matter content. It ranges from medium acid through mildly alkaline.

Most areas of this complex are in woodland. The potential of this complex for trees is moderately high. The steeper slopes and the large amount of Rock outcrop limit the use of equipment.

Rock outcrop, slope, and depth to bedrock in the Opequon soils limit most uses of this complex other than for woodland and wildlife habitat.

This Rock outcrop-Opequon complex is in capability subclass VIIs.

44B—Swimley silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on moderately broad ridges in the Shenandoah Valley. Slopes are smooth and about 200 to 500 feet long. Areas of this soil are oval to rectangular and range from about 5 to 30 acres.

Typically, the surface layer of this Swimley soil is reddish brown silt loam about 9 inches thick. The subsoil extends to a depth of at least 99 inches. It is reddish brown silty clay loam in the upper 5 inches and red clay that is sticky and plastic below this. Light brownish gray and reddish brown mottles are below a depth of 55 inches.

Included with this soil in mapping are small intermingled areas of the Hagerstown, Opequon, Pagebrook, and Timberville soils. The Hagerstown and Opequon soils are similar in location to the Swimley soils. The Pagebrook and Timberville soils are in sinkholes and along narrow intermittent drainageways. Also included are areas of rock outcrops and soils that

Figure 5.—Limestone rock outcrops in areas of the Rock outcrop-Opequon complex, 3 to 45 percent slopes.

have a redder and darker subsoil. Included areas make up about 20 percent of this unit.

The permeability of this Swimley soil is moderate, and the available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer has a high content of clay, especially in eroded areas. The subsoil has a moderate shrink-swell potential in the upper part and a high shrink-swell potential in the lower part. The thickness of the root zone and depth to bedrock are more than 60 inches. The soil has moderate natural fertility and low organic matter content. It ranges from very strongly acid through neutral unless lime has been applied.

Most areas of this soil are cultivated or used for pasture. A small acreage is in woodland.

This Swimley soil is well suited to cultivated crops. Soil acidity and natural fertility are limitations in some areas. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is only fair but can be improved and maintained by incorporating organic matter into the soil and by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This soil is moderately well suited to fruits, nuts, and berries; however, poor air drainage, soil acidity, and the

moderate natural fertility are limitations to its use. Yields can be increased by applying lime and fertilizer.

This soil is well suited to pasture, although it is limited by acidity and only moderate natural fertility in some areas. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Swimley soil for trees is high. The high clay content limits the use of timber equipment, especially during periods of extreme wetness.

Moderate permeability is a limitation to the use of this soil for septic tank absorption fields and sewage lagoons. High clay content is a limitation for trench type sanitary landfills, cover for landfills, and shallow excavations. High shrink-swell potential is a limitation for dwellings and small commercial buildings. Low soil strength is a limitation for local roads and streets. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields. This soil is well suited, however, to most types of recreation.

This Swimley soil is in capability subclass IIe.

45B—Swimley silt loam, rocky, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on broad ridges in the Shenandoah Valley. Slopes are smooth and about 200 to 1,000 feet long. Areas of this soil are long and winding and range from about 5 to 150 acres. Outcrops of limestone bedrock are roughly 100 to 300 feet apart.

Typically, the surface layer of this Swimley soil is reddish brown silt loam about 9 inches thick. The subsoil extends to a depth of at least 99 inches. It is reddish brown silty clay loam in the upper part and red clay that is sticky and plastic in the lower part. Light brownish gray and reddish brown mottles are below a depth of 55 inches.

Included with this soil in mapping are small intermingled areas of the Hagerstown, Opequon, Pagebrook, and Timberville soils. The Hagerstown and Opequon soils are similar in location to the Swimley soils. The Pagebrook and Timberville soils are in sinkholes and along narrow intermittent drainageways. Also included are soils that have more coarse fragments in the surface layer and soils that have a redder and darker subsoil. Areas of included soils make up about 20 percent of this unit.

The permeability of this Swimley soil is moderate, and the available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer has a high content of clay, especially in eroded areas. The subsoil has a moderate shrink-swell potential in the upper part and a high shrink-swell potential in the lower part. The thickness of the root zone and depth to bedrock are more than 60 inches. The soil has moderate natural fertility and low organic matter content. It ranges from very strongly acid through neutral unless lime has been applied.

Most areas of this soil are cultivated or used for pasture. A small acreage is in woodland.

This Swimley soil is moderately well suited to cultivated crops. Outcrops of limestone bedrock interfere with seedbed preparation and cultivating and harvesting operations. Also, soil acidity and moderate natural fertility are limitations in some areas. Contour tillage, conservation tillage (fig. 6), and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is only fair but can be improved and maintained by incorporating organic matter into the soil and by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This soil is moderately well suited to fruits, nuts, and berries; however, poor air drainage, soil acidity, and moderate natural fertility are limitations to its use. Yields can be increased by applying lime and fertilizer. Rock outcrops interfere with mowing.

This soil is well suited to pasture, but rock outcrops interfere with mowing to control weeds. Also, acidity and moderate natural fertility are limitations to the use of this soil in some areas. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Swimley soil for trees is high. The high clay content limits the use of timber equipment, especially during periods of extreme wetness.

The moderate permeability and rock outcrops are limitations to the use of this soil for septic tank absorption fields and sewage lagoons. The high clay content is a limitation for trench type sanitary landfills, cover for landfills, and shallow excavations. The high shrink-swell potential in the lower part of the subsoil is a limitation for dwellings and small commercial buildings. Low soil strength is a limitation for local roads and streets. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields. This soil is well suited, however, to most types of recreation.

This Swimley soil is in capability subclass IIe.

46B—Swimley-Hagerstown silt loams, 3 to 8 percent slopes. This gently sloping complex is deep and well drained. These soils are on narrow and broad ridges in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. This map unit is about 45 percent Swimley soils, 35 percent Hagerstown soils, and 20 percent other soils. Slopes are smooth and about 200 to 1,000 feet

Figure 6.—Conservation tillage of row crops reduces runoff, controls erosion, and conserves moisture on Swimley silt loam, rocky, 3 to 8 percent slopes.

long. Areas of this complex are long and winding and range from about 5 to 100 acres.

Typically, the surface layer of this Swimley soil is reddish brown silt loam about 9 inches thick. The subsoil extends to a depth of at least 99 inches. It is reddish brown silty clay loam in the upper part and red clay that is sticky and plastic in the lower part. Light brownish gray and reddish brown mottles are below a depth of 55 inches.

Typically, the surface layer of this Hagerstown soil is brown silt loam about 6 inches thick. The subsoil extends to a depth of 49 inches. It is strong brown and yellowish red silty clay loam in the upper part and yellowish red silty clay in the lower part. The substratum is yellowish red silty clay that contains many highly weathered light gray limestone fragments. Hard limestone bedrock is at a depth of 52 inches.

Included with these soils in mapping are small intermingled areas of the Duffield, Nicholson, Opequon, Pagebrook, and Timberville soils. The Duffield and Nicholson soils are on ridges, in concave heads of drainageways, and in saddles. The Opequon soils are similar in location to the Swimley and Hagerstown soils. The Pagebrook and Timberville soils are in depressions and along narrow, winding drainageways. Also included are scattered outcrops of limestone bedrock that are generally more than 300 feet apart, soils that have a cherty surface layer, severely eroded soils that have a clay surface layer (fig. 7), and areas that are steeper.

The permeability of the Swimley and Hagerstown soils is moderate, and the available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer of both soils has a high clay content, especially in eroded areas. The subsoil of the Swimley soils has a moderate shrink-swell potential in the upper part and a high shrink-swell potential in the lower part. The Hagerstown soils have a moderate shrink-swell potential. The thickness of the root zone and depth to bedrock are more than 60 inches in the Swimley soils and are 40 to 60 inches or more in the Hagerstown soils.

The Swimley soils have moderate natural fertility and low organic matter content; the Hagerstown soils have high natural fertility and moderate organic matter content. The Swimley soils range from very strongly acid

through neutral unless lime has been applied. The surface layer and upper part of the subsoil of the Hagerstown soils are very strongly acid or strongly acid, and the lower part of the subsoil and substratum range from strongly acid through moderately alkaline.

Most areas of this complex are cultivated or used for pasture. A small acreage is in woodland.

This Swimley-Hagerstown complex is well suited to cultivated crops. Soil acidity and the moderate natural fertility of the Swimley soils are limitations in some areas. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is only fair but can be improved and maintained by incorporating organic matter into the soil and by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This complex is moderately well suited to fruits, nuts, and berries; however, its use is limited by poor air drainage, soil acidity, and moderate natural fertility of the Swimley soils. Yields can be increased by applying lime and fertilizer.

This complex is well suited to pasture. Limitations are acidity and moderate natural fertility in some areas. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Swimley soils for trees is high, and that of the Hagerstown soils is very high. The high clay content limits the use of timber equipment, especially during periods of extreme wetness.

The moderate permeability is a limitation to the use of these soils for septic tank absorption fields and sewage lagoons. The high clay content is a limitation for trench-type sanitary landfills, cover for landfills, and shallow excavations. The high shrink-swell potential in the lower part of the Swimley soils is a limitation for dwellings and small commercial buildings. Low soil strength is a limitation for local roads and streets. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields. This complex is well suited, however, to most types of recreation.

This Swimley-Hagerstown complex is in capability subclass IIe.

47B—Swimley-Hagerstown silt loams, rocky, 3 to 8 percent slopes. This gently sloping complex is deep and well drained. These soils are on broad ridges in the Shenandoah Valley. They are so intermingled that it was

Figure 7.—Severely eroded cornfield on Swimley-Hagerstown silt loams, 3 to 8 percent slopes.

not practical to map them separately. This map unit is about 40 percent Swimley soils, 35 percent Hagerstown soils, and 25 percent other soils. Slopes are smooth and about 200 to 1,000 feet long. Areas of this complex are long and winding and range from about 5 to 150 acres. Outcrops of limestone bedrock are roughly 100 to 300 feet apart.

Typically, the surface layer of this Swimley soil is reddish brown silt loam about 9 inches thick. The subsoil extends to a depth of at least 99 inches. It is reddish brown silty clay loam in the upper part and red clay that is sticky and plastic in the lower part. Light brownish gray and reddish brown mottles are below a depth of 55 inches.

Typically, the surface layer of this Hagerstown soil is brown silt loam about 6 inches thick. The subsoil extends to a depth of 49 inches. It is strong brown and yellowish red silty clay loam in the upper part and yellowish red silty clay in the lower part. The substratum is yellowish red silty clay with many highly weathered light gray limestone fragments. Hard limestone bedrock is at a depth of 52 inches.

Included with these soils in mapping are small intermingled areas of the Duffield, Nicholson, Opequon, Pagebrook, and Timberville soils. The Duffield and Nicholson soils are on ridges, in concave heads of drainageways, and in saddles. The Opequon soils are similar in location to the Swimley and Hagerstown soils. The Pagebrook and Timberville soils are in depressions and along narrow, winding drainageways. Also included are soils that do not have outcrops of limestone bedrock, soils that have a cherty surface layer, severely eroded soils that have a clay surface layer (fig. 8), and areas that are steeper.

The permeability of the Swimley and Hagerstown soils is moderate, and the available water capacity is

Figure 8.—Aerial view of a plowed field of Swimley-Hagerstown silt loams, rocky, 3 to 8 percent slopes. The dark spots are areas where the topsoil has eroded.

moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer of both soils has a high clay content, especially in eroded areas. The shrink-swell potential of the subsoil of the Swimley soils is moderate in the upper part and high in the lower part. The Hagerstown soils have a moderate shrink-swell potential. The thickness of the root zone and depth to bedrock are more than 60 inches in the Swimley soils and 40 to 60 inches or more in the Hagerstown soils.

The Swimley soils have moderate natural fertility and low organic matter content. The Hagerstown soils have high natural fertility and moderate organic matter content. The Swimley soils range from very strongly acid through neutral unless lime has been applied. The surface layer and upper part of the subsoil of the Hagerstown soils are very strongly acid or strongly acid, and the lower part of the subsoil and the substratum range from strongly acid through moderately alkaline.

Most areas of this complex are cultivated or used for pasture. A small acreage is in woodland and orchards.

This Swimley-Hagerstown complex is moderately well suited to cultivated crops. Rock outcrops interfere with seedbed preparation and cultivating and harvesting operations. Soil acidity and the moderate natural fertility of the Swimley soils are limitations in some areas. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is only fair but can be improved and maintained by incorporating organic matter into the soil and by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This complex is moderately well suited to fruits, nuts, and berries; however, its use is limited by poor air drainage, soil acidity, and the moderate natural fertility of the Swimley soils. Yields can be increased by applying lime and fertilizer. Rock outcrops interfere with mowing to control weeds.

This complex is well suited to pasture; however, rock outcrops interfere with mowing. Soil acidity and moderate natural fertility are also limitations in some areas. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Swimley soils for trees is high, and that of the Hagerstown soils is very high. The high clay content limits the use of timber equipment, especially during periods of extreme wetness.

The moderate permeability and rock outcrops are limitations to the use of this complex for septic tank absorption fields and sewage lagoons. The high clay content is a limitation for trench-type sanitary landfills, cover for landfills, and shallow excavations. The high shrink-swell potential in the lower part of the subsoil of the Swimley soils is a limitation for dwellings and small commercial buildings. Low soil strength is a limitation for local roads and streets. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields. This complex is well suited, however, to most types of recreation.

This Swimley-Hagerstown complex is in capability subclass IIe.

47C—Swimley-Hagerstown silt loams, rocky, 8 to 15 percent slopes. This sloping complex is deep and well drained. These soils are on narrow side slopes in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. This map unit is about 40 percent Swimley soils, 35 percent Hagerstown soils, and 25 percent other soils. Slopes are smooth and about 200 to 400 feet long. Areas of this complex are long and winding and range from about 5 to 25 acres. Outcrops of limestone bedrock are roughly 100 to 300 feet apart.

Typically, the surface layer of this Swimley soil is reddish brown silt loam about 9 inches thick. The subsoil extends to a depth of at least 99 inches. It is reddish brown silty clay loam in the upper part and red clay that is sticky and plastic in the lower part. Light brownish gray and reddish brown mottles are below a depth of 55 inches.

Typically, the surface layer of this Hagerstown soil is brown silt loam about 6 inches thick. The subsoil extends to a depth of 49 inches. It is strong brown and yellowish red silty clay loam in the upper part and yellowish red silty clay in the lower part. The substratum is yellowish red silty clay that contains many highly weathered light gray limestone fragments. Hard limestone bedrock is at a depth of 52 inches.

Included with these soils in mapping are small intermingled areas of the Duffield, Nicholson, Opequon, Pagebrook, and Timberville soils. The Duffield and Nicholson soils are on ridges, in concave heads of drainageways, and in saddles. The Opequon soils are similar in location to the Swimley and Hagerstown soils. The Pagebrook and Timberville soils are in depressions and along narrow, winding drainageways. Also included are soils that do not have outcrops of limestone bedrock, soils that have a cherty surface layer, severely eroded soils that have a clay surface layer, and areas that are steeper.

The permeability of the Swimley and Hagerstown soils is moderate, and the available water capacity is moderate. Surface runoff is rapid. The erosion hazard is severe. The surface layer of both soils has a high clay content, especially in eroded areas. The shrink-swell potential of the subsoil of the Swimley soils is moderate in the upper part and high in the lower part. The Hagerstown soils have a moderate shrink-swell potential. The thickness of the root zone and depth to bedrock are

more than 60 inches in the Swimley soils and range from 40 to 60 inches or more in the Hagerstown soils.

The Swimley soils have moderate natural fertility and low organic matter content. The Hagerstown soils have high natural fertility and moderate organic matter content. The Swimley soils range from very strongly acid through neutral unless lime has been applied. The surface layer and upper part of the subsoil of the Hagerstown soils are very strongly acid or strongly acid, and the lower part of the subsoil and the substratum range from strongly acid through moderately alkaline.

Most areas of this complex are cultivated or used for pasture. A small acreage is in woodland and orchards.

This Swimley-Hagerstown complex is moderately well suited to cultivated crops. Rock outcrops interfere with seedbed preparation and cultivating and harvesting operations. Soil acidity and the moderate natural fertility of the Swimley soils are limitations in some areas. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Tilth is only fair but can be improved and maintained by incorporating organic matter into the soil and by plowing at optimum moisture content. Crop yields can be increased by applying lime and fertilizer.

This complex is moderately well suited to fruits, nuts, and berries; however, its use is limited by poor air drainage, soil acidity, and the moderate natural fertility of the Swimley soils. Yields can be increased by applying lime and fertilizer. Rock outcrops interfere with mowing to control weeds.

This complex is well suited to pasture; however, rock outcrops interfere with mowing. Soil acidity and moderate natural fertility are also limitations in some areas. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Swimley soils for trees is high, and that of the Hagerstown soils is very high. The high clay content limits the use of timber equipment, especially during periods of extreme wetness.

The moderate permeability, rock outcrops, and slope are limitations to the use of this complex for septic tank absorption fields and sewage lagoons. The high clay content is a limitation for trench-type sanitary landfills, cover for landfills, and shallow excavations. The high shrink-swell potential and slope are limitations for dwellings and small commercial buildings. The low soil strength is a limitation for local roads and streets. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields. This complex is well suited, however, to most types of recreation.

This Swimley-Hagerstown complex is in capability subclass IIIe.

48B—Swimley-Rock outcrop complex, 3 to 8 percent slopes. This undulating complex consists of deep and well drained Swimley soils and outcrops of limestone bedrock that are so intermingled that it was not practical to map them separately. It is on narrow and broad ridges in the Shenandoah Valley. This complex is about 50 percent Swimley soils, 25 percent limestone Rock outcrop, and 25 percent other soils. Slopes are rough and complex and about 200 to 600 feet long. Areas of this complex are oval to rectangular and range from about 5 to 60 acres. Rock outcrops are roughly 10 to 100 feet apart.

Typically, the surface layer of this Swimley soil is reddish brown silt loam about 9 inches thick. The subsoil extends to a depth of at least 99 inches. It is reddish brown silty clay loam in the upper part and red clay that is sticky and plastic in the lower part. Light brownish gray and reddish brown mottles are below a depth of 55 inches.

Included with this soil in mapping are small intermingled areas of the Hagerstown, Opequon, Pagebrook, and Timberville soils. The Hagerstown and Opequon soils are similar in location to the Swimley soils. The Pagebrook and Timberville soils are in sinkholes and along narrow intermittent drainageways. Also included are soils that have a redder and darker subsoil. Areas of the included soils make up about 20 percent of this map unit.

The permeability of the Swimley soil is moderate, and the available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer has a high content of clay, especially in eroded areas. The subsoil has a moderate shrink-swell potential in the upper part and a high shrink-swell potential in the lower part. The thickness of the root zone and depth to bedrock are more than 60 inches. The soil has moderate natural fertility and low organic matter content. It ranges from very strongly acid through neutral unless lime has been applied.

About half this complex is used for pasture, and the remainder is in woodland.

This Swimley-Rock outcrop complex is not suited to cultivated crops and is poorly suited to fruits, nuts, and berries. The large amount of Rock outcrop makes use of machinery for seedbed preparation and for cultivating and harvesting of crops impracticable. Rock outcrop interferes with the use of equipment for spraying and weed control in orchards and causes skipped spaces in the tree planting patterns.

This complex is moderately well suited to pasture. Rock outcrop limits the use of all but light machinery and hand tools for improving pasture and controlling weeds. Rotating pastures, deferring grazing, controlling weeds,

proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Swimley soils for trees is high. The high clay content limits the use of timber equipment, especially during periods of extreme wetness. Also, Rock outcrop interferes with the use of equipment for harvesting timber.

Closely spaced areas of limestone Rock outcrop and moderate permeability limit the use of this complex for septic tank absorption fields and sewage lagoons. Rock outcrop and high clay content limit its use for trench-type sanitary landfills, shallow excavations, lawns, topsoil, and cover for landfills. Rock outcrop, low soil strength, and shrink-swell potential are limitations for dwellings, small commercial buildings, and local roads and streets. Sinkholes and solution channels in the bedrock increase the hazard of contamination of wells and ground water by surface runoff and seepage from septic tank absorption fields.

This Swimley-Rock outcrop complex is in capability subclass VIs.

49B—Thurmont loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on narrow to moderately broad stream terraces in the Shenandoah Valley. Slopes are smooth and about 200 to 600 feet long. Areas of this soil are long and winding and range from about 5 to 40 acres.

Typically, the surface layer of this Thurmont soil is brown loam about 13 inches thick. The subsoil extends to a depth of 58 inches. It is brown loam and clay loam in the upper part, yellowish red clay loam with light yellowish brown mottles in the middle part, and yellowish red sandy clay loam with strong brown and light gray mottles in the lower part. The substratum extends to a depth of at least 68 inches. It is yellowish red sandy clay loam with light gray and black mottles.

Included with this soil in mapping are small intermingled areas of the Braddock, Chagrin, Lobdell, Monongahela, and Zoar soils. The Braddock and Monongahela soils are similar in location to the Thurmont soils. The Chagrin soils are on flood plains. The Lobdell and Zoar soils are in depressions and along narrow intermittent drainageways. Also included are areas that are steeper and areas along Opequon Creek and other small streams that have a silt loam surface layer. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Thurmont soil is moderate, and the available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer is friable and easily tilled. The subsoil has a low shrink-swell potential. The thickness of the root zone and depth to bedrock are more than 60 inches. The soil is low in natural fertility and organic matter content. It is very strongly acid or strongly acid unless lime has been applied. A seasonal high water table is at a depth of 4 feet or more from December through March.

Most areas of this soil are cultivated or used for pasture. A small acreage is in woodland.

This Thurmont soil is well suited to cultivated crops. The major limitations are acidity and low natural fertility. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Crop yields can be increased by applying lime and fertilizer.

This soil is moderately well suited to fruits, nuts, and berries; however, poor air drainage, acidity, and low natural fertility are major limitations to its use. Yields can be increased by applying lime and fertilizer.

This soil is well suited to pasture. Limitations are acidity and low natural fertility. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Thurmont soil for trees is high. Seeds and seedlings survive and grow well if competing vegetation is controlled.

Moderate permeability and the high water table limit the use of this soil for septic tank absorption fields, sewage lagoons, sanitary landfills, shallow excavations, and dwellings with basements. Frost action is a limitation for local roads and streets. This soil, however, is well suited to most types of recreation.

This Thurmont soil is in capability subclass IIe.

50B—Thurmont gravelly loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on narrow to moderately broad stream terraces in the Shenandoah Valley. Slopes are smooth and about 200 to 500 feet long. Areas of this soil are long and winding and range from about 5 to 40 acres.

Typically, the surface layer of this Thurmont soil is brown gravelly loam about 9 inches thick. The subsoil extends to a depth of 48 inches. It is brown gravelly loam and gravelly clay loam in the upper part, yellowish red gravelly clay loam with brown mottles in the middle part, and yellowish red gravelly sandy clay loam with strong brown and light gray mottles in the lower part. The substratum extends to a depth of at least 60 inches. It is yellowish red gravelly sandy clay loam with light gray and black mottles.

Included with this soil in mapping are small intermingled areas of the Braddock, Chagrin, Lobdell, Monongahela, and Zoar soils. The Braddock and Monongahela soils are similar in location to the Thurmont soils. The Chagrin soils are on flood plains. The Lobdell and Zoar soils are in depressions and along narrow intermittent drainageways. Also included are areas that are steeper and areas where the soil contains cobblestones and stones. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Thurmont soil is moderate, and the available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer and subsoil have a high content of coarse fragments. The subsoil has a low shrink-swell potential. The thickness of the root zone and depth to bedrock are more than 60 inches. The soil is low in natural fertility and organic matter content. It is very strongly acid or strongly acid unless lime has been applied. A seasonal high water table is at a depth of 4 feet or more from December through March.

Most areas of this soil are cultivated or used for pasture. A small acreage is in woodland.

This Thurmont soil is well suited to cultivated crops. The large number of coarse fragments in the surface layer interferes with planting and tillage operations. Other limitations are acidity and low natural fertility. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Crop yields can be increased by applying lime and fertilizer.

This soil is moderately well suited to fruits, nuts, and berries; however, poor air drainage, acidity, and low natural fertility are major limitations. Yields can be increased by applying lime and fertilizer.

This soil is well suited to pasture. Limitations are acidity and low natural fertility. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Thurmont soil for trees is high. Seeds and seedlings survive and grow well if competing vegetation is controlled.

Moderate permeability and the seasonal high water table limit the use of this soil for septic tank absorption fields, sewage lagoons, sanitary landfills, shallow excavations, and dwellings with basements. Frost action is a limitation for local roads and streets. Coarse fragments on the surface limit the use of this soil for lawns and most types of recreation.

This Thurmont soil is in capability subclass IIe.

51B—Timberville silt loam, 0 to 7 percent slopes. This nearly level to gently sloping soil is deep and well drained. It is on narrow to moderately broad upland drainageways in the Shenandoah Valley. Slopes are smooth and about 200 to 700 feet long. Areas of this soil are long and winding and range from about 5 to 80 acres.

Typically, the surface layer of this Timberville soil is dark yellowish brown silt loam about 9 inches thick. The subsoil is dark yellowish brown silt loam to a depth of 21 inches. A buried surface layer that is dark brown silt loam extends from 21 to 31 inches. Below that, a buried subsoil that is yellowish red clay loam and yellowish red clay extends to a depth of at least 81 inches.

Included with this soil in mapping are small intermingled areas of the Hollywood, McGary, Pagebrook, and Weaver soils. The Hollywood, McGary, and Weaver soils are in depressions and concave scour channels of flood plains and near escarpments. The Pagebrook soils are similar in location to the Timberville soils. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Timberville soil is moderate, and the available water capacity is high. Surface runoff is medium. The erosion hazard is moderate. The surface layer is friable and easy to till. The subsoil has a low shrink-swell potential in the upper part and a moderate shrink-swell potential in the lower part. The thickness of the root zone and depth to bedrock are more than 60 inches. The soil has high natural fertility and moderate organic matter content. It ranges from very strongly acid through medium acid unless lime has been applied. The soil is frequently flooded by runoff from higher adjacent areas.

Most areas of this soil are cultivated or used for pasture. The remainder is in woodland.

This Timberville soil is well suited to cultivated crops, although flooding from adjacent higher areas sometimes delays the use of equipment. Crop yields can be increased by applying lime and fertilizer. Conservation tillage reduces runoff, helps control erosion, and conserves moisture. Row crops can be grown continuously on this soil.

This soil is poorly suited to fruits, nuts, and berries. Poor air drainage causes freezing of fruit buds.

This soil is well suited to pasture. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Timberville soil for trees is high. Seeds and seedlings survive and grow well if competing vegetation is controlled.

Flooding and low soil strength are the main limitations for the use of this soil for septic tank absorption fields, sewage lagoons, sanitary landfills, shallow excavations, dwellings, small commercial buildings, and local roads and streets. These limitations also affect most types of recreation.

This Timberville soil is in capability subclass IIw.

52B—Udipsamments, 0 to 8 percent slopes. This nearly level to gently sloping map unit consists of deep and excessively drained to moderately well drained soils. These soils are on narrow natural levees adjacent to streams in the Shenandoah Valley. Slopes are smooth and about 100 to 400 feet long. Areas of these soils are long and winding and range from about 5 to 30 acres.

Included with this unit in mapping are small intermingled areas of the Buckton, Chagrin, Lobdell, and Weaver soils. The Buckton and Chagrin soils are

adjacent to the natural levees. The Lobdell and Weaver soils are in depressions and scour channels. Also included are areas of soils that have loamy or gravelly surface layers. Areas of the included soils make up about 25 percent of this map unit.

The permeability of these Udipsamments is rapid, and the available water capacity is low. Surface runoff is slow. The erosion hazard is slight. The surface layer and substratum are sandy. The shrink-swell potential is low. The thickness of the root zone and depth to bedrock are more than 60 inches. Udipsamments have low natural fertility and low organic matter content. They are slightly acid through moderately alkaline. Udipsamments are frequently flooded for brief periods.

Most of this map unit is in woodland. A small acreage is farmed or is in pasture.

These Udipsamments are moderately well suited to cultivated crops. Cultural operations and productivity are limited by the flood hazard and low available water capacity. Conservation tillage and grasses and legumes in the cropping system conserve moisture, help control erosion, and maintain the organic matter content. Row crops can be grown continuously on these soils. Crop yields can be increased by applying fertilizer, but lime is generally not needed.

This unit is poorly suited to fruits, nuts, and berries. The major limitations are poor air drainage, low available water capacity, and flooding. Poor air drainage causes freezing of fruit buds. The low available water capacity reduces the size of fruit and affects development of fruit buds. Flooding limits the use of machinery for spraying and weed control.

This unit is moderately well suited to pasture. The low available water capacity limits its use. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying fertilizer increase the productivity and carrying capacity of pastures.

The potential of this map unit for trees is moderately high. Seedling growth is limited by the low available water capacity.

Flooding limits the use of these soils for septic tank absorption fields, sewage lagoons, sanitary landfills, shallow excavations, dwellings, small commercial buildings, and local roads and streets. These limitations also affect most types of recreation.

These Udipsamments have not been assigned a capability subclass.

53—Udorthents, loamy. This map unit consists of deep and well drained soils that have been disturbed by construction or excavation. These soils are primarily in the vicinity of Berryville. Mapped areas are generally variable in size and shape. Slope ranges from 0 to 4 percent.

Included with this unit in mapping are small areas of the undisturbed Swimley, Poplimento, and Webbtown soils. Also included are areas, such as parking lots, that are covered by asphalt or cement. Areas of the included soils make up about 15 percent of this map unit.

The permeability of these Udorthents is moderate to very slow, and the available water capacity is moderate. Runoff is slow to rapid. The erosion hazard is slight to severe. The shrink-swell potential varies from low to moderate.

These Udorthents are used mainly for residential and industrial development, parking lots, and playgrounds. An onsite investigation is required to determine their suitability for specific uses.

These Udorthents have not been assigned a capability subclass.

54C—Udorthents, extremely stony, 0 to 45 percent slopes. This nearly level to very steep map unit consists of deep, well drained and moderately well drained soils. These soils are in heads of drainageways, at the base of steep rocky slopes, and along intermittent drainageways that extend from near the crest of the Blue Ridge Mountains westward into the foothills. Slopes are smooth and about 100 to 1,500 feet long. Areas of these soils are long and winding and range from 5 to 50 acres. Stones more than 10 inches in diameter that are generally less than 5 feet apart cover from 15 to 50 percent of the surface.

Included with these Udorthents in mapping are small, intermingled areas of the Catoctin, Dekalb, Lew, and Laidig soils and Fluvaquents. The Catoctin and Dekalb soils are on convex uplands. The Lew and Laidig soils are similar in location to the Udorthents. The Fluvaquents are adjacent to small drainageways or in depressions. Also included are many areas that have large boulders and some areas where more than 50 percent of the surface is covered with stones. Areas of the included soils make up about 25 percent of this map unit.

The permeability of these Udorthents is moderately rapid, and the available water capacity is moderate. Surface runoff is rapid. The erosion hazard is severe. The soil material between the rock fragments has a low shrink-swell potential. The root zone extends to more than 60 inches but is restricted by a high content of rock fragments. Depth to bedrock is more than 60 inches. These Udorthents range from very strongly acid through slightly acid. They are frequently flooded for very brief periods.

Large stones on the surface, slope, and flooding severely limit the suitability of these Udorthents for most uses other than woodland. The potential of this map unit for trees is low because of the low available water capacity and stoniness. The large stones also limit the use of timber harvesting equipment.

These Udorthents have not been assigned a capability subclass.

55D—Udults-Udalfs association, 15 to 45 percent slopes. This moderately steep to very steep map unit consists of moderately deep and deep, well drained soils. These soils are mainly on narrow escarpments between flood plains and terraces along the Shenandoah River. Each delineated area has both Udults and Udalfs, but the percentage composition varies. Slopes are smooth and about 100 to 400 feet long. Areas of these soils are long and winding and range from about 5 to 50 acres.

Included with these Udults and Udalfs in mapping are small intermingled areas of the Braddock, Chagrin, Lobdell, Monongahela, Poplimento, Thurmont, and Webbtown soils. The Braddock, Monongahela, and Thurmont soils are on small included ridges and noses of less sloping interfluves. The Chagrin and Lobdell soils are on flood plains. The Poplimento and Webbtown soils are similar in location to the Udults and Udalfs. Also included are areas that have gullies, stones on the surface, or rock outcrops. Areas of the included soils make up about 25 percent of this map unit.

The permeability of Udults and Udalfs is variable. It ranges from slow in areas where there is a fragipan to moderate where the subsoil is loamy. The available water capacity is also variable and ranges from low where there is a fragipan to high where the subsoil is loamy. Surface runoff is rapid. The erosion hazard is severe. The surface texture is variable, and the shrink-swell potential varies from low to high. The Udults have low natural fertility, and the Udalfs have high natural fertility. They both have moderate organic matter content. The thickness of the root zone ranges from 20 to 60 inches or more, but root penetration is restricted by a high content of coarse fragments in some areas. Depth to bedrock ranges from 20 to 60 inches or more, and in some areas it varies greatly within a very short horizontal distance. Unless lime has been applied, the Udults are very strongly acid or strongly acid throughout, and the Udalfs are very strongly acid and strongly acid in the upper part but range from medium acid through moderately alkaline in the lower part.

Most areas of this unit are in woodland. A small acreage is used for pasture.

This Udults-Udalfs association is generally not suited to cultivated crops or to fruits, nuts, and berries. Slope severely limits the use of equipment.

This association is moderately well suited to pasture, but most equipment is limited by slope. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of these Udults and Udalfs for trees is moderately high. Slope severely limits the use of equipment in managing and harvesting timber.

Slope generally limits the use of this association for septic tank absorption fields, sewage lagoons, landfills, dwellings, small commercial buildings, and roads and streets. These limitations also affect most types of recreation.

This Udults-Udalfs association has not been assigned a capability subclass.

56—Weaver silt loam. This soil is deep, nearly level, and moderately well drained. It is on moderately broad flood plains in the Shenandoah Valley, usually below large springs in areas underlain by limestone and calcareous shale. Areas are long and winding and range from about 5 to 100 acres. Slopes are smooth and about 200 to 800 feet long and range from 0 to 3 percent.

Typically, the surface layer of this Weaver soil is brown silt loam about 8 inches thick. The subsoil is brown silt loam that extends to a depth of 19 inches. The substratum is brown silt loam mottled with grayish brown to a depth of 24 inches. A buried surface layer extends to a depth of 28 inches. It is very dark gray loam. Below this a buried subsoil of dark gray loam extends to a depth of 37 inches. It is underlain by another buried surface layer of mottled dark gray, very dark gray, and very pale brown loam to a depth of 44 inches. Below this another buried subsoil of very dark gray loam extends to a depth of 54 inches. The substratum below this is mottled brown and gray silt loam and brown silt loam to a depth of at least 71 inches.

Included with this soil in mapping are small intermingled areas of the Buckton, Hollywood, Lobdell, McGary, Pagebrook, and Timberville soils. The Buckton and Lobdell soils are in slightly higher and larger areas than the Weaver soil. The Hollywood and McGary soils are similar in location to the Weaver soil. The Pagebrook and Timberville soils are in higher areas, at the base of escarpments, and in small colluvial areas along intermittent drainageways. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Weaver soil is moderate, and the available water capacity is moderate. Surface runoff is slow. A seasonal high water table is at a depth of 1 1/2 to 2 1/2 feet, and the soil is occasionally flooded for very brief periods from December through March. The erosion hazard is slight. The surface is friable and easily tilled. The thickness of the root zone and depth to bedrock are 40 to 60 inches. The soil has a low shrink-swell potential, high natural fertility, and moderate organic matter content. The surface layer and subsoil range from neutral through moderately alkaline. The substratum and buried horizons are mildly alkaline or moderately alkaline.

This soil is well suited to cultivated crops, and most of the acreage is farmed. Tilth is good, and row crops can be grown continuously. Flooding occasionally damages crops, however, or limits the use of machinery. Crop yields can be increased by applying fertilizer, but lime is not needed. Conservation tillage helps conserve moisture and reduces erosion.

This soil is poorly suited to fruits, nuts, and berries, mainly because poor air drainage causes freezing of fruit buds. Flooding limits the use of machinery for spraying and weed control.

This soil is well suited to pasture and hay grasses. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Weaver soil for trees is high; however, most areas are farmed. Occasional flooding limits the use of equipment in managing and harvesting timber.

Flooding and the seasonal high water table are the major limitations of this soil for septic tank absorption fields and sanitary facilities, shallow excavations, dwellings, and small commercial buildings. Flooding is also a limitation for camp areas and playgrounds.

This Weaver soil is in capability subclass IIw.

57C2—Webbtown-Poplimento-Rock outcrop complex, 3 to 15 percent slopes, eroded. This complex consists of moderately deep Webbtown soils and deep Poplimento soils that are undulating to rolling and well drained and outcrops of limestone, shale, siltstone, and sandstone bedrock. The unit is on ridges and side slopes in the Shenandoah Valley. The soils and rock are so intermingled that it was not practical to map them separately. This map unit is about 30 percent Webbtown soils, 25 percent Poplimento soils, 20 percent Rock outcrop, and 25 percent other soils. Slopes are rough and complex and about 200 to 500 feet long. Areas of this complex are long and winding and range from about 5 to 40 acres. Rock outcrops are roughly 10 to 100 feet apart.

Typically, the surface layer of this Webbtown soil is brown shaly silt loam about 5 inches thick. The subsoil extends to a depth of 38 inches. It is brown shaly silt loam in the upper part, strong brown shaly silty clay loam in the middle part, and yellowish red shaly silty clay that is sticky and plastic in the lower part. The substratum is strong brown very shaly silt loam from 38 to 49 inches and mottled red, brown, and yellow very shaly silty clay to a depth of at least 72 inches.

Typically, the surface layer of this Poplimento soil is dark yellowish brown silt loam about 5 inches thick. The subsoil extends to a depth of 41 inches. It is strong brown silty clay loam in the upper part, strong brown clay in the middle part, and strong brown shaly silty clay in the lower part. The substratum is strong brown shaly silty clay to a depth of at least 73 inches.

Included with these soils in mapping are small intermingled areas of the Braddock, Monongahela, Pagebrook, Timberville, and Weaver soils. The Braddock and Monongahela soils are on higher parts of the side slopes and on narrow ridges. The Pagebrook and Weaver soils are along narrow drainageways and on foot slopes. The Timberville soils are in heads of drainageways, along narrow intermittent drainageways, and in saddles and depressions.

The permeability of the Webbtown and Poplimento soils is moderately slow, and the available water capacity is moderate. Surface runoff is medium to rapid. The erosion hazard is moderate to severe. The surface layer of both soils is friable, but the Webbtown soils have a high content of shale fragments. The shrink-swell potential of the subsoil of the Webbtown soils is moderate, and that of the Poplimento soils is high. The thickness of the root zone and depth to bedrock are more than 30 inches in the Webbtown soils and more than 48 inches in the Poplimento soils. Depth to bedrock is extremely variable over short distances in both soils.

Both soils have medium natural fertility and low organic matter content. Unless lime has been applied, the surface layer and upper part of the subsoil range from very strongly acid through medium acid in the Poplimento soils and from strongly acid through slightly acid in the Webbtown soils. The lower part of the subsoil and the substratum range from strongly acid through slightly acid in the Poplimento soils and from medium acid through neutral in the Webbtown soils.

About half this complex is used for pasture, and the remainder is in woodland.

This Webbtown-Poplimento-Rock outcrop complex is not suited to cultivated crops and is poorly suited to fruits, nuts, and berries. Rock outcrop makes the use of all machinery for seedbed preparation and for cultivating and harvesting of crops impractical. Rock outcrop also interferes with spraying and weed control equipment in orchards. It also causes skipped spaces in the tree planting patterns.

This complex is moderately well suited to pasture. Rock outcrop limits the use of all but light machinery and hand tools to improve pasture and control weeds. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Webbtown soils for trees is moderate, and that of the Poplimento soils is high. The high clay content in the Poplimento soils limits the use of timber equipment, especially during periods of extreme wetness. The large number of shale fragments in the Webbtown soils limits seedling survival and growth. Also, Rock outcrop interferes with the use of timber harvesting equipment.

The depth to bedrock in the Webbtown soils, the moderately slow permeability, Rock outcrop, slope, low strength of both soils, and the high clay content and high shrink-swell potential in the Poplimento soils limit the use of this complex for sanitary facilities, dwellings, small commercial buildings, local roads and streets, and most types of recreation. Also the large number of shale

fragments on the surface of the Webbtown soils limits their use for lawns or golf fairways and most types of recreation.

This Webbtown-Poplimento-Rock outcrop complex is in capability subclass VIs.

57D2—Webbtown-Poplimento-Rock outcrop complex, 15 to 30 percent slopes, eroded. This hilly to steep complex consists of moderately deep Webbtown soils and deep Poplimento soils that are well drained and Rock outcrop of limestone, shale, siltstone, and sandstone bedrock. The unit is on narrow side slopes in the Shenandoah Valley, and the soils are so intermingled that it was not practical to map them separately. This map unit is about 30 percent Webbtown soils, 25 percent Poplimento soils, 20 percent Rock outcrop, and 25 percent other soils. Slopes are rough and complex and about 200 to 500 feet long. Areas of this complex are long and winding and range from about 5 to 30 acres. Areas of Rock outcrop are roughly 10 to 100 feet apart.

Typically, the surface layer of this Webbtown soil is brown shaly silt loam about 5 inches thick. The subsoil extends to a depth of 38 inches. It is brown shaly silt loam in the upper part, strong brown shaly silty clay loam in the middle part, and yellowish red shaly silty clay that is sticky and plastic in the lower part. The substratum is strong brown very shaly silt loam to a depth of 49 inches and is mottled red, brown, and yellow very shaly silty clay to a depth of at least 72 inches.

Typically, the surface layer of this Poplimento soil is dark yellowish brown silt loam about 5 inches thick. The subsoil extends to a depth of 41 inches. It is strong brown silty clay loam in the upper part, strong brown clay in the middle part, and strong brown shaly silty clay in the lower part. The substratum is strong brown shaly silty clay to a depth of at least 73 inches.

Included with these soils in mapping are small intermingled areas of the Braddock, Monongahela, Pagebrook, Timberville, and Weaver soils. The Braddock and Monongahela soils are on higher parts of the side slopes. The Pagebrook and Weaver soils are along narrow drainageways and on foot slopes. The Timberville soils are in heads of drainageways, along narrow intermittent drainageways, and in saddles and depressions. Also included are areas that are steeper.

The permeability of the Webbtown and Poplimento soils is moderately slow, and the available water capacity is moderate. Surface runoff is very rapid. The erosion hazard is severe. The surface layer of both soils is friable, but the Webbtown soils have a high content of shale fragments. The shrink-swell potential of the subsoil of the Webbtown soils is moderate, and that of the Poplimento soils is high. The thickness of the root zone and depth to bedrock are more than 30 inches in the Webbtown soils and more than 48 inches in the Poplimento soils. Depth to bedrock is extremely variable over short distances in both soils.

Both soils have medium natural fertility and low organic matter content. Unless lime has been applied, the surface layer and upper part of the subsoil range from very strongly acid through medium acid in the Poplimento soils and from strongly acid through slightly acid in the Webbtown soils. The lower part of the subsoil and the substratum range from strongly acid through slightly acid in the Poplimento soils and from medium acid through neutral in the Webbtown soils.

About half this complex is used for pasture, and the remainder is in woodland.

This Webbtown-Poplimento-Rock outcrop complex is not suited to cultivated crops or to fruits, nuts, and berries. Slope and Rock outcrop make the use of all machinery for seedbed preparation and for cultivating and harvesting of crops impractical. Also, slope and Rock outcrop limit the use of spraying and mowing equipment for weed control in orchards.

This complex is poorly suited to pasture. Rock outcrop limits the use of all but light machinery and hand tools to improve pasture. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of the Webbtown soils for trees is moderate, and that of the Poplimento soils is high. The high clay content of the Poplimento soils limits the use of timber equipment, especially during periods of extreme wetness. Rock outcrop and slope also interfere with its use. The high content of shale fragments in the Webbtown soils limits seedling survival and growth.

The depth to rock in the Webbtown soils, the moderately slow permeability, slope, Rock outcrop, the low strength of both soils, and the high clay content and high shrink-swell potential in the Poplimento soils limit the use of this complex for sanitary facilities, dwellings, small commercial buildings, local roads and streets, and most types of recreation. Also, the large number of shale fragments on the surface of the Webbtown soils limits their use for lawns or golf fairways and most types of recreation.

This Webbtown-Poplimento-Rock outcrop complex is in capability subclass VIIs.

58D—Weikert-Berks shaly silt loams, 15 to 45 percent slopes. This complex consists of shallow Weikert soils and moderately deep Berks soils. These soils are hilly to very steep and well drained and are on narrow side slopes in the Shenandoah Valley. They are so intermingled that it was not practical to map them separately. This map unit is about 50 percent Weikert soils, 30 percent Berks soils, and 20 percent other soils. Slopes are rough and complex and about 200 to 600 feet long. Areas of these soils are long and winding and range from about 5 to 30 acres.

Typically, the surface layer of this Weikert soil is dark yellowish brown shaly silt loam about 5 inches thick. The subsoil is yellowish brown very shaly silt loam 7 inches thick. The substratum is yellowish brown very shaly silt loam. Rippable shale bedrock is at a depth of 15 inches.

Typically, the surface layer of this Berks soil is dark yellowish brown shaly silt loam about 5 inches thick. The subsoil is yellowish brown shaly silt loam 13 inches thick. The substratum is brownish yellow very shaly silt loam. Rippable shale bedrock is at a depth of 22 inches.

Included with these soils in mapping are small intermingled areas of the Berks Variant, Dandridge, Timberville, and Weaver soils. The Berks Variant and Dandridge soils are similar in location to the Weikert and Berks soils. The Timberville and Weaver soils are in depressions, along narrow drainageways, and in the heads of dranageways. Also included are outcrops of rippable shale bedrock that are generally more than 300 feet apart and soils that have a silt loam or silty clay loam surface layer.

The permeability of this Weikert soil is moderately rapid, and that of the Berks soil is moderate. The available water capacity is very low for both soils. Surface runoff is very rapid. The erosion hazard is severe. The surface layer and subsoil of both soils have a high content of shale fragments. The subsoil of both soils has a low shrink-swell potential. The thickness of the root zone and depth to bedrock are 10 to 20 inches in the Weikert soils and 20 to 40 inches in the Berks soils. Both soils are low in natural fertility and moderate in organic matter content. They range from very strongly acid through medium acid.

The rough, complex, hilly to very steep slopes limit the use of this complex mainly to woodland and wildlife habitat. The potential of this Weikert soil for trees is low, and that of the Berks soil is moderate. Seedling survival and growth are limited by the very low available water capacity and high content of shale fragments in these soils.

These Weikert-Berks soils are in capability subclass VIIe.

59B—Whiteford silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained. It is on moderately broad, low-lying ridges in the foothills of the Blue Ridge Mountains. Slopes are smooth and about 200 to 900 feet long. Areas of this soil are long and winding and range from about 5 to 80 acres.

Typically, the surface layer of this Whiteford soil is dark grayish brown silt loam about 5 inches thick. The subsoil extends to a depth of 40 inches. It is strong brown silt loam in the upper part, yellowish red silty clay loam in the middle part, and mottled red, yellowish red, and brownish yellow slaty clay loam in the lower part. The substratum is brown slaty clay loam. Hard slate bedrock is at a depth of 54 inches.

Included with this soil in mapping are small intermingled areas of the Cardiff, Cataska, Clymer, Dekalb, and Laidig soils. The Cardiff, Clymer, and Dekalb soils are similar in location to the Whiteford soils. The Cataska soils are on steeper slopes. The Laidig soils are in saddles, heads of drainageways, and depressions. Areas of the included soils make up about 20 percent of this map unit.

The permeability of this Whiteford soil is moderate, and the available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer is friable. The subsoil has a low shrink-swell potential. The thickness of the root zone and depth to bedrock are 40 to 60 inches. The soil is low in natural fertility and organic matter content. It is very strongly acid or strongly acid unless lime has been applied.

Most areas of this soil are in woodland. A small acreage is cultivated or used for pasture or orchards.

This Whiteford soil is well suited to cultivated crops. The major limitations are acidity and low natural fertility. Contour tillage, conservation tillage, and crop rotations that include grasses and legumes reduce runoff, help control erosion, and conserve moisture. Crop yields can be increased by applying lime and fertilizer.

This soil is moderately well suited to fruits, nuts, and berries. The low natural fertility and acidity are limitations to its use. Yields can be increased by applying lime and fertilizer.

This soil is moderately well suited to pasture. Limitations are acidity and low natural fertility. Establishing and maintaining a mixture of grasses and legumes, rotating pastures, deferring grazing, controlling weeds, proper stocking, and applying lime and fertilizer increase the productivity and carrying capacity of pastures.

The potential of this Whiteford soil for trees is high. Seeds and seedlings survive and grow well if competing vegetation is controlled.

The depth to bedrock is a limitation to the use of this soil for septic tank absorption fields, sewage lagoons, trench-type sanitary landfills, shallow excavations, and dwellings with basements. The potential frost action limits its use for dwellings with basements, small commercial buildings, and local roads and streets and as a source of roadfill material. This soil is well suited to most types of recreation.

This Whiteford soil is in capability subclass IIe.

prime farmland

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is treated and managed according to acceptable farming methods. Prime farmland produces the highest

yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland may now be in crops, pasture, woodland, or other land, but not in urban and built-up land or water areas. It must be used for producing food or fiber or be available for this use.

Prime farmland usually has an adequate and dependable supply of moisture from precipitaton or irrigation. It also has a favorable temperature and growing season and acceptable levels of acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated for long periods and is not flooded during the growing season. The slope ranges mainly from 3 to 8 percent. For more detailed information on the criteria for prime farmland consult the local staff of the Soil Conservation Service.

The supply of high-quality farmland is limited. About 9,395 acres, or nearly 8.4 percent, of Clarke County meets the soil requirements for prime farmland.

A recent trend in land use in some parts of the county has been the loss of some prime farmlands to industrial and urban uses. This loss of prime farmland puts pressure on marginal lands, which are farmed although they generally are more erodible, droughty, and difficult to cultivate and usually are less productive.

Following is a list of soil map units that make up prime farmland in Clarke County. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 5. The location is shown on the detailed soil maps in the back of this publication. The soil qualities that affect use and management are described in the section "Detailed soil map units."

2B	Braddock loam, 3 to 8 percent slopes
28B	Myersville-Catoctin silt loams, 3 to 8 percent slopes
31B	Oaklet silt loam, 3 to 8 percent slopes
35B	Poplimento silt loam, 3 to 8 percent slopes
44B	Swimley silt loam, 3 to 8 percent slopes
46B	Swimley-Hagerstown silt loams, 3 to 8 percent slopes
49B	Thurmont loam, 3 to 8 percent slopes
50B	Thurmont gravelly loam, 3 to 8 percent slopes
59B	Whiteford silt loam, 3 to 8 percent slopes

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

Glenn Anderson, conservation agronomist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 66,900 acres in Clarke County was used for crops and pasture in 1967, according to the Virginia Conservation Needs Inventory (*5*). Of this total, about 7,500 acres was used for row crops (corn and soybeans); 5,000 acres for close-grown crops (wheat, rye, oats, and barley); 10,800 acres for rotation hay and pasture; 6,000 acres for hay; 32,500 acres for pasture; and 4,000 acres for orchards, vineyards, and bush fruit. About 1,100 acres was idle land.

Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are the major concerns in pasture management. They can be accomplished by proper stocking, rotating and deferring grazing, controlling weeds, restricting grazing during extremely wet and dry seasons, and applying lime and fertilizer. Stockpiling the accumulated growth of tall fescue for winter grazing reduces the need for hay.

The major plants grown and harvested for hay are orchardgrass and Kentucky-31 fescue. Alfalfa is suitable for many soils in the survey area if appropriate amounts of lime and fertilizer are applied.

Special crops grown in the county on a small scale are vegetables, peaches, strawberries, and nursery plants. Most of these crops are produced for local markets, and apples are also produced for commercial markets. Clarke County is the second leading apple-producing county in Virginia.

Most of the well-drained soils in the county are suitable for orchards and nursery plants. The deep, well drained upland soils derived from limestone are best suited to apples. Soils in low positions on the landscape, where air drainage is poor and frost is frequent, are generally poorly suited to early vegetables, small fruits, or orchards.

The preferred type of surface and subsurface drainage varies with the kind of soil. Sometimes a combination of surface and subsurface drainage can be used. Drains must be more closely spaced in slowly permeable soils than in the more permeable soils. Subsurface drainage is

suited to moderately permeable soils. Some of the soils that have a fragipan can be drained with subsurface drains if the fragipan is deep.

Field crops suited to the soils and climate of the survey area include corn, soybeans, and grain sorghum. Wheat, oats, barley, and rye are the common small grains.

Pasture in Clarke County generally consists of bluegrass, tall fescue, orchardgrass, or clover. Most improved pastures are bluegrass and Dutch white clover mixtures. Pastures of cool-season plants provide most of the grazing in the spring and autumn.

Soil tilth is an important factor in the germination of seeds and the infiltration of water into the soil. Soils that have good tilth are granular and porous. Poor tilth causes clodding, less soil-seed contact, and a poorer stand of plants.

Most soils used for crops in the survey area have a surface layer of fine sandy loam, loam, silt loam, or silty clay loam and are low in organic matter content. Generally the structure of such soils is weak, and rainfall causes a crust to form on the surface. The crust, which is hard when dry, reduces infiltration of water and increases runoff. Regular additions of crop residue and other organic material improve soil structure and reduce crust formation.

Tilth is a particular concern on the Berks Variant, McGary, Zoar, Pagebrook, and Monongahela soils. These soils often stay wet until about midspring. If they are wet when plowed, they tend to be cloddy when dry, and a good seedbed is difficult to prepare.

Drainage is a major management need in some areas used for crops and pasture. Some soils are naturally so wet that they cannot be used to produce crops common to the area unless drained. These include the somewhat poorly drained McGary soils and Fluvaquents.

Contour stripcropping and using grassed waterways are suitable erosion-control practices and are best suited to soils that have smooth, uniform slopes. Terraces and diversions also reduce the length of slope, runoff, and the hazard of erosion. They are most practical on deep, well drained soils that have long, regular slopes. The Poplimento, Swimley, and Oaklet soils are suitable for terraces, but they need substantial plant cover to control erosion.

Conservation tillage, leaving crop residue on the surface, and using winter cover crops increase infiltration and reduce the hazards of runoff and erosion. These practices are suitable for most soils in the county, but are difficult to use on the more eroded soils.

Soil fertility is low in many soils in the county, and most soils are strongly acid unless they have been limed. The Carbo, Endcav, Poplimento, and Swimley soils on uplands and the Buckton and Lobdell soils on flood plains are generally less acid, however, and have moderate or high natural fertility. The proper pH level enables crops to use fertilizer and soil moisture more efficiently. Crops respond well to applications of lime and fertilizer when applied according to soil tests.

Erosion can be controlled by providing a protective surface cover, reducing runoff, and increasing water infiltration. For example, using a cropping system that keeps the plant cover on the soil for extended periods controls erosion and helps maintain the productive capacity of the soils. On livestock farms, the legume and grass forage crops included in the cropping system reduce erosion, provide nitrogen, and improve tilth for the crop that follows.

Soil erosion is the major concern on most of the cropland in Clarke County. Most soils have slopes of more than 2 percent and therefore are susceptible to erosion.

Loss of the surface layer through erosion reduces the productivity, fertility, and water holding capacity of the soil. Erosion is especially damaging to soils with a clayey subsoil, such as the Carbo, Oaklet, Endcav, Braddock, Poplimento, Hagerstown, and Swimley soils, and soils with bedrock near the surface. Erosion also reduces productivity of soils that tend to be droughty, such as the Lakin and Weikert soils.

Soil erosion also causes sediment to build up in the streams. Control of erosion minimizes the pollution of streams by sediment and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed.

The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Norman O. Wilson, Forester, Soil Conservation Service, helped prepare this section.

Woodland is one of the major land uses in Clarke County. About 34,000 acres, or 30 percent of the county, is in commercial woodland.

In general, oak-hickory is the major forest type in the county. In this forest type, upland oaks or hickory trees, singly or in combination, comprise the major part of the stocking. Most of the stocking in Clarke County consists of oak species. Oak-hickory forests grow mainly on the Catoctin, Myersville, Dekalb, Laidig, and Weikert soils.

These stands of oak and hickory are moderately productive. They can be improved by cutting the low-quality trees for firewood, thereby releasing the better trees for expanded growth.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that

limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

recreation

Many of Clarke County's recreational activities are planned by local church, civic, and social organizations. Thoroughbred horses for the tracks, shows, and sale rings are raised on several famous farms in the county. The Blue Ridge Hunt Club, which dates back many years, sponsors an annual horse show.

The large orchards on the Swimley and Poplimento soils add beauty to the area, especially in the spring. At that time, the annual Apple Blossom Festival in Winchester brings thousands of visitors to Clarke and Fredrick Counties.

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or

stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bluegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are shrub honeysuckle, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are white pine, Virginia pine, and redcedar.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are

created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are waterfowl feeding areas and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, and mink.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer;

stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive

or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain

sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the

root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 15, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight,

of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent

collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*4*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 17, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning simple, plus *udalf*, the suborder of the Alfisols that have minimal horizonation).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*3*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*4*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Berks series

The Berks series consists of moderately deep and well drained soils on ridges and side slopes in the Shenandoah Valley. These soils formed in materials weathered from shale, siltstone, and fine-grained sandstone. Slope ranges from 3 to 45 percent.

The Berks soils commonly are near the Berks Variant and Weikert soils. The Berks soils are better drained than the Berks Variant soils, and they are deeper than the Weikert soils.

Typical pedon of Berks shaly silt loam, in an area of Berks-Berks Variant shaly silt loam, 3 to 8 percent

slopes, approximately 0.4 mile northwest of the junction of Virginia Highways 655 and 620 and 0.9 mile southwest of the junction of Highways 655 and 634:

Ap—0 to 7 inches; dark yellowish brown (10YR 4/4) shaly silt loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine and medium roots; 30 percent shale fragments; mildly alkaline; clear smooth boundary.
B2—7 to 25 inches; yellowish brown (10YR 5/4) shaly silt loam; many medium distinct yellowish red (5YR 4/8) and strong brown (7.5YR 5/6) mottles; weak medium and fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; many silt coatings on shale fragments; 40 percent shale fragments; strongly acid; gradual smooth boundary.
C—25 to 34 inches; brownish yellow (10YR 6/6) very shaly silt loam; many medium faint strong brown (7.5YR 5/6) mottles; massive; friable, slightly sticky, slightly plastic; many silt coatings on shale fragments; 80 percent shale fragments; strongly acid; gradual smooth boundary.
R—34 inches; rippable tilted shale.

The thickness of the solum ranges from 18 to 36 inches. Depth to bedrock ranges from 20 to 40 inches. Coarse fragments of shale, fine-grained sandstone, or siltstone make up 10 to 50 percent of the A horizon, 25 to 75 percent of individual subhorizons of the B2 horizon, and 60 to 80 percent of the C horizon. The weighted average of coarse fragments between 10 inches and hard bedrock is more than 35 percent. The soil ranges from very strongly acid through medium acid unless limed.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 3 or 4. It is shaly silt loam or shaly loam. The B horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 through 8. It is shaly or very shaly silt loam or loam. The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 through 6. It is very shaly silt loam or loam. The bedrock is rippable shale, siltstone, or fine-grained sandstone that is fractured and has very few voids.

Berks Variant

The Berks Variant series consists of moderately deep and somewhat poorly drained soils in saddles and concave heads of drainageways and on side slopes in the Shenandoah Valley. These soils formed in materials weathered from shale, siltstone, and fine-grained sandstone. Slope ranges from 3 to 15 percent.

The Berks Variant soils commonly are near the Berks and Weikert soils. The Berks Variant soils are wetter than the other soils.

Typical pedon of Berks Variant shaly silt loam, in an area of Berks-Berks Variant shaly silt loams, 3 to 8 percent slopes, approximately 660 feet northwest of the junction of Virginia Highways 634 and 657:

Ap—0 to 8 inches; dark yellowish brown (10YR 4/4) shaly silt loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine and medium roots; 40 percent shale fragments; medium acid; clear smooth boundary.
B2—8 to 24 inches; yellowish brown (10YR 5/4) shaly silt loam; many medium distinct light olive gray (5Y 6/2) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; 45 percent shale fragments; strongly acid; gradual smooth boundary.
C—24 to 32 inches; yellowish brown (10YR 5/4) very shaly silt loam; many medium distinct gray (5Y 6/1) and black (10YR 2/1) mottles on shale fragments; massive; friable, slightly sticky, slightly plastic; few medium clay flows; 80 percent shale fragments; strongly acid; gradual smooth boundary.
R—32 inches; rippable tilted shale.

The thickness of the solum ranges from 18 to 36 inches. Depth to bedrock ranges from 20 to 40 inches. Coarse fragments of shale, fine-grained sandstone, or siltstone make up 15 to 50 percent of the A horizon, 25 to 75 percent of individual subhorizons of the B2 horizon, and 50 to 85 percent of the C horizon. The weighted average of coarse fragments between 10 inches and hard bedrock is more than 35 percent. The soil ranges from very strongly acid through medium acid unless limed.

The A horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 3 or 4. It is shaly silt loam or shaly loam. The B horizon has hue of 10YR through 5Y, value of 5 through 7, and chroma of 4 through 8. It is shaly silt loam, shaly loam, or very shaly silt loam. The C horizon has colors similar to those of the B horizon. It is very shaly silt loam or very shaly loam. The bedrock is rippable shale, siltstone, or fine-grained sandstone that is fractured and has very few voids.

Braddock series

The Braddock series consists of deep and well drained soils on low-lying ridges and foot slopes in the foothills of the Blue Ridge Mountains and on stream terraces in the Shenandoah Valley. These soils formed in colluvial and alluvial sediments derived mainly from crystalline igneous rocks. Slope ranges from 3 to 45 percent.

The Braddock soils commonly are near the Monongahela and Zoar soils. The Braddock soils are better drained than the other soils.

Typical pedon of Braddock loam, 3 to 8 percent slopes, approximately 0.4 mile southwest of the northern junction of Virginia Highways 606 and 649 and 150 feet west of Highway 606:

O1—2 inches to 0; undecomposed leaves and twigs and black (10YR 2/1) partially decomposed organic matter.

A1—0 to 2 inches; black (10YR 2/1) loam; strong fine and medium granular structure; very friable; many fine medium and coarse roots; 2 percent pebbles; very strongly acid; clear smooth boundary.

A2—2 to 11 inches; yellowish brown (10YR 5/4) loam; weak fine and medium granular structure; friable, slightly sticky, slightly plastic; many fine medium and coarse roots; 2 percent pebbles; very strongly acid; clear smooth boundary.

B1t—11 to 18 inches; red (2.5YR 4/6) clay loam; many medium distinct strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable, sticky, plastic; many fine and medium roots; many medium clay films on faces of peds; 2 percent pebbles; very strongly acid; gradual wavy boundary.

B21t—18 to 31 inches; dark red (2.5YR 3/6) clay; common medium distinct yellowish red (5YR 5/8) mottles; moderate fine and medium subangular blocky structure; friable, sticky, plastic; common fine and medium roots; medium continuous clay films on faces of peds; 5 percent pebbles; strongly acid; clear smooth boundary.

B22t—31 to 42 inches; dark red (2.5YR 3/6) clay; many medium distinct strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable, sticky, plastic; common fine and medium roots; medium continuous clay films on faces of peds; 15 percent pebbles and cobblestones; strongly acid; clear smooth boundary.

IIB31t—42 to 58 inches; dark red (2.5YR 3/6) cobbly clay; many medium distinct strong brown (7.5YR 5/6), olive (5Y 5/4), and very dark grayish brown (10YR 3/2) mottles; moderate medium and fine subangular blocky structure; friable, sticky, plastic; few fine roots; many medium clay films on faces of peds; 35 percent cobblestones and pebbles; very strongly acid; diffuse smooth boundary.

IIB32t—58 to 74 inches; red (2.5YR 4/6) cobbly clay loam; many medium distinct olive (5Y 5/4) and strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; friable, sticky, plastic; many medium clay films on faces of peds; 35 percent cobblestones and pebbles; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches or more. Depth to bedrock is more than 5 feet. Rock fragments make up 2 to 35 percent of the A and B horizons and 2 to 80 percent or more of the C horizon. The soil is very strongly acid or strongly acid unless limed.

The A1 or Ap horizon has hue of 7.5YR or 10YR, value of 2 through 5, and chroma of 1 through 4. The A2 horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 8. The A horizon is loam or sandy loam or the gravelly or cobbly analogs of those textures. The B1 horizon has hue of 2.5YR through 7.5YR, value of 4 or 5, and chroma of 4 through 8. It is sandy clay loam or clay loam or the gravelly or cobbly analogs of those textures. The B2t horizon has hue of 10YR or 2.5YR, value of 3 through 5, and chroma of 6 or 8. It is clay loam or clay or the gravelly or cobbly analogs of those textures. Some pedons do not have a lithologic discontinuity. The B3 horizon has colors similar to those of the B2t horizon. It is cobbly clay or cobbly clay loam. The C horizon has colors similar to those of the B2t horizon and is usually mottled. It is loamy soil material with variable amounts of rock fragments.

Buckton series

The Buckton series consists of deep and well drained soils on flood plains in the Shenandoah Valley. These soils formed in loamy, calcareous, alluvial sediments derived mainly from limestone, sandstone, shale, and granite. Slope ranges from 0 to 3 percent.

The Buckton soils are taxadjuncts because they have more sand in the control section than is defined as the range for the series. This does not affect the use and management of the soils.

The Buckton soils commonly are near the Chagrin, Lobdell, and Weaver soils and the Udipsamments. The Buckton soils are not as acid throughout as the Chagrin soils and are better drained than the Lobdell or Weaver soils. They are not as sandy as the Udipsamments.

Typical pedon of Buckton silty clay loam, in an area of Buckton soils, approximately 0.2 mile south of the junction of Opequon Creek and U.S. Highways 17 and 50:

Ap—0 to 7 inches; brown (10YR 4/3) silty clay loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; many fine roots; many wormholes; slight effervescence; mildly alkaline; clear smooth boundary.

C1—7 to 19 inches; brown (10YR 4/3) clay loam; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; many wormholes; strong effervescence; moderately alkaline; diffuse smooth boundary.

C2—19 to 31 inches; brown (10YR 4/3) loam; weak coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; many wormholes; 2 percent shale fragments; strong effervescence; moderately alkaline; gradual smooth boundary.

C3—31 to 48 inches; brown (10YR 4/3) loam; few medium faint dark brown (10YR 3/3) mottles; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine roots; many wormholes; 2 percent lime concretions; violent effervescence; moderately alkaline; clear smooth boundary.

IIC4—48 to 56 inches; brown (10YR 4/3) sandy loam; many medium distinct very pale brown (10YR 7/4) mottles; massive; friable, slightly sticky, slightly plastic; few fine roots; 10 percent lime concretions and 10 percent gastropod and brachiopod shells; violent effervescence; moderately alkaline; clear smooth boundary.

IIC5—56 to 77 inches; brown (10YR 4/3) loam; massive; friable, slightly sticky, slightly plastic; few fine roots; 2 percent gastropod and brachiopod shells; violent effervescence; moderately alkaline.

Depth to bedrock is more than 5 feet. Secondary carbonate concretions range from 0 to 10 percent throughout. Coarse fragments of calcareous shells, shale, chert, sandstone, quartzite, and greenstone make up 0 to 2 percent of the upper part of the soil and 0 to 15 percent of the lower part. The soil is mildly alkaline or moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 through 4. It is sandy loam, fine sandy loam, silt loam, silty clay loam, loam, or clay loam. The C horizon has hue of 5YR to 10YR, value of 3 through 5, and chroma of 2 through 4. It is sandy loam, fine sandy loam, silt loam, silty clay loam, loam, clay loam, or sandy clay loam. The IIC horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 2 through 4. It is stratified alluvium with variable textures. Some pedons have beds of cobblestones and gravel.

Carbo series

The Carbo series consists of moderately deep and well drained soils on ridges and side slopes in the Shenandoah Valley. These soils formed in materials weathered from limestone interbedded with shale. Slope ranges from 3 to 15 percent.

The Carbo soils commonly are near the McGary, Oaklet, Opequon, and Pagebrook soils. The Carbo soils are better drained than the McGary soils, are not as deep as the Oaklet or Pagebrook soils, and are deeper than the Opequon soils.

Typical pedon of Carbo silty clay loam, in an area of Oaklet-Carbo complex, rocky, 3 to 8 percent slopes, approximately 0.2 mile west-northwest of the junction of Virginia Highways 644 and 646 and 100 feet north of Highway 646:

Ap—0 to 7 inches; brown (10YR 4/3) silty clay loam; few medium distinct yellowish brown (10YR 5/6) mottles; moderate medium and fine granular structure; firm, sticky, plastic; many fine roots; 1 percent iron concretions; neutral; abrupt smooth boundary.

B21t—7 to 12 inches; yellowish brown (10YR 5/6) clay; few medium distinct brown (10YR 4/3) mottles; moderate fine subangular blocky structure; firm, sticky, plastic; common fine roots; common medium clay films and slickensides on faces of peds; 1 percent iron concretions; neutral; clear smooth boundary.

B22t—12 to 30 inches; yellowish brown (10YR 5/8) clay; strong fine subangular blocky structure; firm, very sticky, very plastic; few fine roots; continuous medium clay films and slickensides on faces of peds; 1 percent iron concretions; strongly acid; clear smooth boundary.

B23t—30 to 37 inches; dark yellowish brown (10YR 4/4) clay; moderate fine subangular blocky structure; firm, very sticky, very plastic; few fine roots; continuous medium clay films and slickensides on faces of peds; 1 percent iron concretions; mildly alkaline; abrupt smooth boundary.

R—37 inches; hard dark gray limestone.

The thickness of the solum and depth to bedrock range from 20 to 40 inches. Coarse fragments, usually limestone, shale, and quartz, make up 0 to 10 percent of the A horizon and 0 to 15 percent of the B horizon. Iron concretions range from 0 to 10 percent in the solum. Some pedons have secondary carbonate concretions in the lower part of the Bt horizon and in the C horizon. The soil ranges from very strongly acid through neutral in the A horizon and upper part of the Bt horizon and from medium acid through mildly alkaline in the lower part of the Bt horizon and in the C horizon.

The A horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 3 through 6. Value of 3 is limited to A1 or Ap horizons less than 6 inches thick. The A horizon is silt loam, silty clay loam, silty clay, or clay. The B2t horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 4 through 8. It is clay. Some pedons have B3 and C horizons that have hue of 7.5YR through 2.5Y, value of 4 or 5, and chroma of 4 through 8. Some pedons have high-chroma mottles. The B3 and C horizons are clay or silty clay. The bedrock is hard, dark gray and black limestone and limestone interbedded with shale and thin clay strata.

Cardiff series

The Cardiff series consists of deep and well drained soils on ridges and side slopes in the foothills of the Blue Ridge Mountains. These soils formed in materials weathered mainly from slate. Slope ranges from 3 to 45 percent.

The Cardiff soils commonly are near the Cataska and Whiteford soils. The Cardiff soils are deeper than the Cataska soils and do not have an argillic horizon as do the Whiteford soils.

Typical pedon of Cardiff slaty loam, 3 to 8 percent slopes, approximately 0.4 mile southwest of the junction of Virginia Highways 649 and 605 and 300 feet west of Highway 649:

O1—2 inches to O; undecomposed leaves and twigs and black (10YR 2/1) humus.
A1—0 to 1 inch; very dark gray (10YR 3/1) slaty loam; moderate fine granular structure; very friable, slightly sticky, slightly plastic; many fine medium and coarse roots; 30 percent slate fragments; very strongly acid; abrupt smooth boundary.
A2—1 to 7 inches; pale brown (10YR 6/3) slaty loam; weak fine granular structure; friable, slightly sticky, slightly plastic; many fine medium and coarse roots; 30 percent slate fragments; very strongly acid; gradual smooth boundary.
B1—7 to 11 inches; light yellowish brown (10YR 6/4) slaty loam; common medium faint yellowish brown (10YR 5/4) mottles; weak medium and fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine medium and coarse roots; 30 percent slate fragments; very strongly acid; gradual smooth boundary.
B2—11 to 35 inches; light yellowish brown (2.5YR 6/4) slaty loam; weak medium and fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and medium roots; 45 percent slate fragments; very strongly acid; gradual smooth boundary.
C—35 to 46 inches; light yellowish brown (2.5Y 6/4) very slaty loam; massive; friable, slightly sticky, slightly plastic; few fine roots; 80 percent slate fragments; strongly acid; clear smooth boundary.
R—46 inches; hard slate that cannot be penetrated with an auger.

The thickness of the solum ranges from 15 to 35 inches. Depth to bedrock ranges from 40 to 60 inches. Coarse fragments of slate, phyllite, and shale make up 20 to 70 percent of the solum and 70 to 90 percent of the C horizon. The soil is very strongly acid or strongly acid unless limed.

The A horizon has hue of 10YR through 5Y, value of 3 through 6, and chroma of 1 through 3. Value of 3 is confined to A1 and Ap horizons less than 6 inches thick. The A horizon is slaty loam or slaty silt loam. The B horizon has hue of 10YR through 5Y, value of 5 or 6, and chroma of 4 through 6. It is slaty loam or slaty silt loam. The C horizon has hue of 10YR through 5Y, value of 6 or 7, and chroma of 4 through 6. It is very slaty loam or very slaty silt loam. The bedrock is hard slate or phyllite.

Cataska series

The Cataska series consists of shallow and excessively drained soils on ridges and side slopes in the foothills of the Blue Ridge Mountains. These soils formed in materials weathered mainly from slate or phyllite. Slope ranges from 15 to 45 percent.

The Cataska soils commonly are near the Cardiff and Whiteford soils. The Cataska soils are not as deep as the other soils.

Typical pedon of Cataska slaty loam, in an area of Cataska-Cardiff slaty loam, 15 to 45 percent slopes, approximately 0.4 mile north of the southern junction of Virginia Highways 606 and 649 along Highway 606:

O1—2 inches to 0; undecomposed and partially decomposed leaves and twigs.
A1—0 to 1 inch; very dark grayish brown (10YR 3/2) slaty loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine and medium roots; 35 percent slate fragments; very strongly acid; clear smooth boundary.
A2—1 to 3 inches; yellowish brown (10YR 5/4) slaty loam; weak fine granular structure; friable, slightly sticky, slightly plastic; many fine medium and coarse roots; 35 percent slate fragments; very strongly acid; gradual smooth boundary.
B2—3 to 13 inches; yellowish brown (10YR 5/4) slaty loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine medium and coarse roots; 45 percent slate fragments; very strongly acid; gradual smooth boundary.
Cr—13 to 21 inches; nearly vertically tilted slate that can be removed with a spade; approximately 20 percent of volume has cracks up to 1 inch containing yellowish brown (10YR 5/4) loam; loam is massive, friable, slightly sticky, and slightly plastic; few fine roots; very strongly acid; clear wavy boundary.
R—21 inches; hard slate with beds almost vertical.

The thickness of the solum ranges from 12 to 20 inches. Depth to hard slate ranges from 20 to 40 inches. Slate fragments make up 15 to 35 percent of the A horizon and 35 to 70 percent of the B horizon. The soil is very strongly acid or strongly acid unless limed.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. The A horizon is slaty loam or slaty silt loam. The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. It is slaty or very slaty loam or silt loam. The Cr horizon has colors similar to those of the B horizon. The fine earth portion is loam or silt loam. Some pedons have a C horizon.

Catoctin series

The Catoctin series consists of moderately deep and well drained soils on ridges and side slopes in the higher

part of the Blue Ridge Mountains. They formed in material weathered from mainly greenstone. Slope ranges from 3 to 45 percent.

The Catoctin soils commonly are near the Dekalb, Laidig, Lew, and Myersville soils. The Catoctin soils have more silt than the Dekalb soils and are not as deep as the Laidig, Lew, or Myersville soils.

Typical pedon of Catoctin cobbly silt loam, in an area of Myersville-Catoctin very stony silt loams, 8 to 15 percent slopes, approximately 0.9 mile north of the junction of Virginia Highways 7 and 601 at Snickers Gap and 0.3 mile northwest of Highway 601:

Ap—0 to 8 inches; brown (10YR 4/3) cobbly silt loam; strong fine granular structure; very friable, slightly sticky, slightly plastic; many fine roots; 20 percent coarse fragments; neutral; clear smooth boundary.

B1—8 to 13 inches; yellowish brown (10YR 5/4) channery silt loam; common medium faint dark yellowish brown (10YR 3/4) mottles; weak fine subangular blocky and moderate fine granular structure; friable, slightly sticky, slightly plastic; common fine roots; few wormholes; 40 percent coarse fragments; neutral; gradual smooth boundary.

B2—13 to 24 inches; strong brown (7.5YR 5/6) channery silt loam; common medium distinct light yellowish brown (10YR 6/4) mottles; weak fine subangular blocky structure; interrupted by lenses and pockets of silty clay loam with many medium clay films on faces of peds and in pores; friable, slightly sticky, slightly plastic; few fine roots; common thin black coatings on ped faces and coarse fragments; 40 percent coarse fragments; neutral; gradual smooth boundary.

C—24 to 32 inches; yellowish brown (10YR 5/6) very channery silt loam; common medium distinct black (10YR 2/1), strong brown (7.5YR 5/6), and pale olive (5Y 6/3) mottles; massive; friable, slightly sticky, slightly plastic; few fine roots; common thin black coatings on coarse fragments; 70 percent coarse fragments; slightly acid; clear smooth boundary.

R—32 inches; hard greenstone.

The thickness of the solum ranges from 14 to 27 inches. Depth to bedrock ranges from 20 to 40 inches. Angular greenstone rock fragments make up 15 to 35 percent of the A horizon, 35 to 55 percent of the B horizon, and 50 to 80 percent of the C horizon. In unlimed areas the soil ranges from strongly acid through slightly acid in the A and B horizons and from medium acid through neutral in the C horizon.

The A horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 2 through 4. It is silt loam or loam in the fine earth fraction. The B horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 4 through 8. It is channery, cobbly, or very channery silt loam or loam interrupted by lenses and pockets of silty clay, silty clay loam, and clay loam. The C horizon is multicolored loamy silt material mixed with 50 to 80 percent partially weathered rock fragments.

Chagrin series

The Chagrin series consists of deep and well drained soils on flood plains in the Shenandoah Valley. These soils formed in alluvial sediments derived mainly from sandstone, shale, slate, limestone, and granite. Slope ranges from 0 to 3 percent.

The Chagrin soils commonly are near the Buckton and Lobdell soils and the Udipsamments. The Chagrin soils are more acid throughout the solum than the Buckton soils and are better drained than the Lobdell soils. They are not as sandy as the Udipsamments.

Typical pedon of Chagrin fine sandy loam, in an area of Chagrin soils approximately 0.7 mile south-southwest of the junction of Virginia Highways 621 and 617, 100 feet east of Highway 621 and 200 feet north of the Shenandoah River (fig. 9):

Ap—0 to 9 inches; brown (10YR 4/3) fine sandy loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; common wormholes; slightly acid; clear smooth boundary.

B21—9 to 23 inches; brown (10YR 4/3) fine sandy loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; many wormholes; neutral; gradual smooth boundary.

B22—23 to 42 inches; brown (10YR 4/3) loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; many wormholes; neutral; diffuse smooth boundary.

C—42 to 72 inches; brown (10YR 4/3) loam; massive; friable, slightly sticky, slightly plastic; few fine roots; neutral.

The thickness of the solum ranges from 24 to 48 inches. Depth to bedrock is more than 5 feet. Coarse fragments make up 0 to 10 percent of the A horizon and 0 to 15 percent of the B horizon. The C horizon has beds of cobblestones and gravel in some areas. The soil is slightly acid or neutral throughout.

The A horizon has hue of 7.5YR or 10YR, value of 4, and chroma of 2 or 3. Some pedons have an A horizon less than 4 inches thick with value of 2 or 3. It is sandy loam, fine sandy loam, loam, or silt loam. The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is fine sandy loam, loam, silt loam, silty clay loam, or clay loam. The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 or 4. It is loam, silt loam, or sandy loam. Some pedons are stratified, and some pedons include loamy sand below 40 inches.

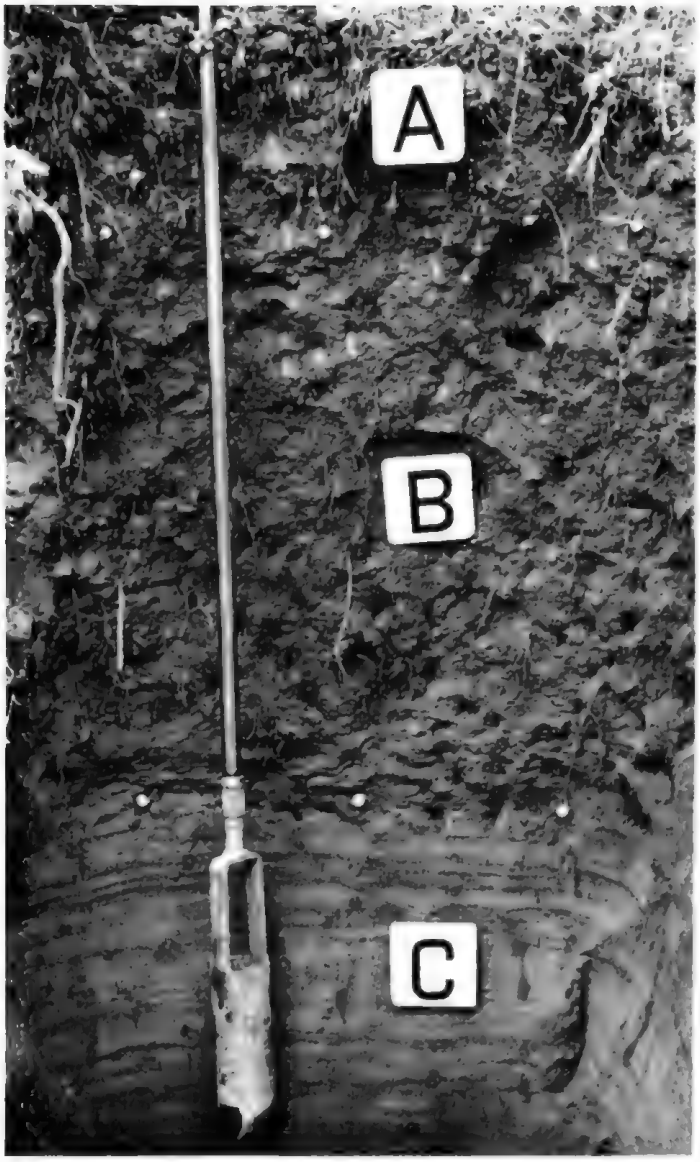


Figure 9.—Profile of Chagrin fine sandy loam in an area of Chagrin soils. The fine stratification in the C horizon was produced by the deposition of alluvial sediments during flood stage. Auger is 60 inches long.

Clymer series

The Clymer series consists of deep and well drained soils on ridges and side slopes in the Blue Ridge Mountains. These soils formed in materials weathered from quartzites and sandstones. Slope ranges from 3 to 15 percent.

The Clymer soils commonly are near the Cardiff, Dekalb, Hazleton, Laidig, and Whiteford soils. The Clymer soils have fewer coarse fragments than the Cardiff, Dekalb, or Hazleton soils; do not have a fragipan as do the Laidig soils; and have more sand throughout than the Whiteford soils.

Typical pedon of Clymer channery loam, 3 to 15 percent slopes, approximately 0.6 mile east-northeast of Castleman's Ferry Bridge:

O1—1 inch to 0; undecomposed and partially decomposed leaves and twigs.

A1—0 to 2 inches; very dark gray (10YR 3/1) channery loam; weak fine granular structure; very friable; many fine and medium roots; 20 percent flat sandstone fragments; strongly acid; clear smooth boundary.

A2—2 to 10 inches; yellowish brown (10YR 5/4) channery loam; weak fine granular structure; friable; many fine and medium roots; 30 percent sandstone fragments; many wormholes; very strongly acid; gradual smooth boundary.

B21t—10 to 20 inches; strong brown (7.5YR 5/6) clay loam; common medium distinct yellowish red (5YR 4/6) mottles; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; continuous medium clay films on faces of peds; 10 percent flat sandstone fragments; few wormholes; very strongly acid; clear wavy boundary.

B22t—20 to 30 inches; strong brown (7.5YR 5/6) channery clay loam; common medium distinct yellowish red (5YR 4/6) and yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common medium clay films on faces of peds; 30 percent flat sandstone fragments; very strongly acid; gradual smooth boundary.

C1—30 to 47 inches; yellowish brown (10YR 5/6) very channery sandy loam; common medium distinct strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) mottles; massive; friable, slightly sticky, slightly plastic; 60 percent flat sandstone fragments; very strongly acid; clear smooth boundary.

C2—47 to 62 inches; yellowish brown (10YR 5/6) very channery sandy loam; common medium distinct strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) mottles; massive; friable, slightly sticky, slightly plastic; 80 percent sandstone fragments; very strongly acid.

The thickness of the solum ranges from 24 to 40 inches. Depth to bedrock ranges from 40 to 60 inches or more. Coarse fragments of sandstone and quartzite make up 10 to 35 percent of the A and B horizons and 20 to 85 percent of the C horizon. The soil ranges from extremely acid through strongly acid unless limed.

The A horizon has hue of 10YR, value of 2 through 5, and chroma of 1 through 4. Value of 2 and chroma of 1 are limited to the A1 horizon less than 6 inches thick. The A horizon is channery loam or channery sandy loam.

The B horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 4 through 8. It is sandy loam, loam, clay loam, or sandy clay loam or the channery analogs of those textures. The C horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 6. It is very channery or channery analogs of sandy loam or loam.

Dandridge series

The Dandridge series consists of shallow and excessively drained soils on ridges and side slopes in the Shenandoah Valley. These soils formed in materials weathered from calcareous siltstones and shales mixed with limestone. Slope ranges from 3 to 15 percent.

The Dandridge soils commonly are near the Berks, Berks Variant, Endcav, and Weikert soils. The Dandridge soils are not as deep as the Berks, Berks Variant, or Endcav soils and are not as acid as the Weikert soils.

Typical pedon of Dandridge shaly silty clay loam, in an area of Endcav-Dandridge complex, 3 to 8 percent slopes, approximately 900 feet south of the junction of Virginia Highway 7 and Opequon Creek:

Ap—0 to 5 inches; dark yellowish brown (10YR 4/4) shaly silty clay loam; moderate medium granular structure; very friable, slightly sticky, slightly plastic; many fine and medium roots; 30 percent shale fragments; slightly acid; clear smooth boundary.

B—5 to 13 inches; strong brown (7.5YR 5/6) shaly silty clay loam; common medium distinct yellowish red (5YR 4/6) mottles; moderate coarse subangular blocky structure; shaly silty clay loam interrupted by common lenses and pockets of silty clay and continuous medium clay films on faces of peds and in pores; friable, sticky, plastic; common fine roots; 45 percent shale fragments; slightly acid; clear irregular boundary.

C—13 to 17 inches; mottled strong brown (7.5YR 5/6), yellowish brown (10YR 5/4), and light olive brown (2.5YR 5/4) very shaly clay; massive; friable, sticky, plastic; few fine roots; common clay flows; 60 percent shale fragments that effervesce with cold 10 percent hydrochloric acid; mildly alkaline; clear irregular boundary.

R—17 inches; hard brownish yellow (10YR 6/6), olive brown (2.5YR 4/4), and black (10YR 2/1) calcareous shale.

The thickness of the solum ranges from 6 to 18 inches. Depth to bedrock ranges from 6 to 20 inches. Coarse fragments of shale make up 15 to 45 percent of the A horizon and 35 to 65 percent of the B and C horizons. The soil ranges from slightly acid through mildly alkaline.

The A horizon has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 2 through 6. Value of 3 is limited to the A1 horizon 1 to 2 inches thick. The A horizon is shaly silty clay loam or shaly silt loam. The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. It is shaly clay loam, shaly silty clay loam, or shaly silty clay. The C horizon has hue of 7.5YR through 5Y, value of 4 through 6, and chroma of 3 through 6. It is very shaly analogs of clay, silty clay, or clay loam. Some pedons have a thin paralithic layer within 20 inches of the surface.

Dekalb series

The Dekalb series consists of moderately deep and well drained soils on ridges and steep mountainsides in the foothills of the Blue Ridge Mountains. These soils formed in materials weathered mainly from sandstone. Slope ranges from 3 to 50 percent.

The Dekalb soils commonly are near the Clymer, Hazleton, and Laidig soils. The Dekalb soils do not have the argillic horizon characteristic of the Clymer soils. They are more shallow to bedrock than the Hazleton soils and do not have a fragipan as do the Laidig soils.

Typical pedon of Dekalb channery sandy loam, in an area of Dekalb-Hazleton channery sandy loams, 3 to 5 percent slopes, approximately 1.3 miles southeast of the junction of Wright's Branch and Virginia Highway 638 and 2 miles north of the junction of Clarke, Warren, and Fauquier Counties:

O1—2 inches to 0; undecomposed and partially decomposed leaves and twigs.

A1—0 to 2 inches; black (10YR 2/1) channery sandy loam; strong fine granular structure; very friable, slightly sticky; many fine and medium roots; 30 percent coarse fragments; very strongly acid; abrupt smooth boundary.

A2—2 to 8 inches; light yellowish brown (10YR 6/4) channery sandy loam; weak fine granular structure; friable, slightly sticky; many fine to coarse roots; 30 percent coarse fragments; very strongly acid; gradual smooth boundary.

B2—8 to 31 inches; yellowish brown (10YR 5/4) channery sandy loam; weak medium and coarse subangular blocky structure; friable, slightly sticky; common fine to coarse roots; 45 percent coarse fragments; strongly acid; gradual smooth boundary.

C—31 to 39 inches; yellowish brown (10YR 5/4) very flaggy sandy loam; massive; friable, slightly sticky; few fine and medium roots; 75 percent coarse fragments; common medium distinct light reddish brown (5YR 6/3) coatings on coarse fragments; strongly acid; gradual smooth boundary.

R—39 inches; hard sandstone bedrock.

The thickness of the solum and depth to hard sandstone and quartzite bedrock range from 20 to 40 inches. Flat sandstone and quartzite fragments up to 10 inches across make up 10 to 60 percent of the A and B horizons and 50 to 90 percent or more of the C horizon.

The soil ranges from extremely acid through strongly acid unless limed.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 through 4. Some pedons have an Ap horizon that has hue of 10YR, value of 4, and chroma of 2 through 4. The A horizon is channery sandy loam, channery loam, flaggy loam, flaggy sandy loam, or very stony sandy loam. The B horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 through 8. It is flaggy, very flaggy, channery, or very channery analogs of loam or sandy loam. Some pedons have a thin incipient Bir horizon. The C horizon has colors similar to those of the B horizon. The C horizon is very channery or very flaggy sandy loam or loamy sand.

Duffield series

The Duffield series consists of deep and well drained soils on ridges in the Shenandoah Valley. These soils formed in loamy colluvial, alluvial, or eolian sediments derived from limestones and shales. Slope ranges from 3 to 8 percent.

The Duffield soils commonly are near the Hagerstown, Nicholson, Poplimento, and Timberville soils. They have less clay than the Hagerstown or Poplimento soils, do not have a fragipan as do the Nicholson soils, and have a higher base saturation than the Timberville soils.

Typical pedon of Duffield silt loam, in an area of Nicholson-Duffield silt loams, 3 to 8 percent slopes, approximately 0.8 mile south of the junction of U.S. Highway 340 and Virginia Highway 7 and 0.2 mile south of Clarke County Intermediate School:

Ap—0 to 10 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium granular structure; friable, slightly sticky, slightly plastic; common fine roots; 5 percent iron concretions; 5 percent chert fragments; neutral; abrupt smooth boundary.

B1t—10 to 17 inches; yellowish brown (10YR 5/8) silt loam; many medium distinct strong brown (7.5YR 5/6) and very pale brown (10YR 7/4) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few thin clay films on faces of peds; 5 percent iron concretions; medium acid; clear smooth boundary.

B21t—17 to 27 inches; yellowish brown (10YR 5/8) silty clay loam; many medium distinct brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; moderate medium and fine subangular blocky structure; friable, slightly sticky, slightly plastic; continuous medium clay films on faces of peds; 10 percent iron concretions; strongly acid; gradual smooth boundary.

B22t—27 to 36 inches; yellowish brown (10YR 5/8) silty clay loam; many medium distinct brown (7.5YR 4/4), strong brown (7.5YR 5/6), and very pale brown (10YR 7/4) mottles; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; continuous medium clay films on faces of peds; 10 percent iron concretions; 5 percent chert fragments; strongly acid; gradual smooth boundary.

B23t—36 to 65 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium distinct brown (7.5YR 4/4), strong brown (7.5YR 5/6), and very pale brown (10YR 7/4) mottles; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; continuous medium clay films on faces of peds; 5 percent iron concretions; 5 percent chert fragments; strongly acid; gradual smooth boundary.

C—65 to 88 inches; yellowish brown (10YR 5/8) silt loam; many medium distinct brown (7.5YR 4/4) and white (10YR 8/2) mottles; massive; friable, slightly sticky, slightly plastic; 5 percent iron concretions; 5 percent shale fragments; strongly acid.

The thickness of the solum ranges from 40 to 70 inches. Depth to bedrock is more than 4 feet. Coarse fragments of limestone, quartzite, chert, and shale make up 0 to 15 percent of the A horizon and upper part of the Bt horizon and 5 to 40 percent of the lower part of the Bt horizon and C horizon. The soil ranges from strongly acid through neutral to about 50 inches and from strongly acid through slightly acid below 50 inches.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 through 4. Only the thin A1 horizon has chroma of 3 with value of 2 and 3. The A horizon is silt loam, loam, or silty clay loam. The Bt horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 8. It is loam, silt loam, silty clay loam, or clay loam. The C horizon has hue of 7.5YR through 2.5Y, value of 4 through 8, and chroma of 3 through 8. It is silt loam, silty clay loam, silty clay, or clay.

Endcav series

The Endcav series consists of deep and well drained soils on ridges and side slopes in the Shenandoah Valley. These soils formed in materials weathered from limestone, calcareous shale, and siltstone. Slope ranges from 3 to 15 percent.

The Endcav soils commonly are near the Berks, Berks Variant, Dandridge, and Weikert soils. The Endcav soils have better developed profiles and fewer coarse fragments than the other soils.

Typical pedon of Endcav silty clay loam, in an area of Endcav-Dandridge complex, 3 to 8 percent slopes, approximately 800 feet west of U.S. Highways 340 and 522 and 0.5 mile southwest of Double Toll Gate:

Ap—0 to 10 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; many fine and medium roots; 10 percent shale fragments; medium acid; abrupt smooth boundary.

B1—10 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium and fine subangular blocky structure; firm, sticky, plastic; common fine roots; 10 percent shale fragments; strongly acid; clear smooth boundary.

B21t—18 to 37 inches; yellowish brown (10YR 5/8) clay; moderate coarse subangular blocky structure; firm, sticky, plastic; common fine roots; many medium clay films on faces of peds; 5 percent shale fragments; strongly acid; clear smooth boundary.

B22t—37 to 42 inches; yellowish brown (10YR 5/6) clay; many medium distinct pale brown (10YR 6/3) mottles; moderate coarse subangular blocky structure; firm, sticky, plastic; few fine roots; many medium clay films and slickensides on faces of peds; neutral; clear wavy boundary.

C1—42 to 54 inches; yellowish brown (10YR 5/6) shaly silty clay; many medium distinct light brownish gray (2.5Y 6/2) and brownish yellow (10YR 6/8) mottles; massive; firm, sticky, plastic; few fine roots; many medium clay films on shale fragments; 25 percent shale fragments; mildly alkaline; gradual wavy boundary.

C2—54 to 64 inches; yellowish brown (10YR 5/6) very shaly silty clay; many medium distinct reddish brown (5YR 4/4) and light brownish gray (2.5Y 6/2) mottles; massive; firm, sticky, plastic; many medium clay films on shale fragments; 70 percent shale fragments; violent effervescence; moderately alkaline; clear wavy boundary.

R—64 inches; hard stratified shale and limestone.

The thickness of the solum ranges from 40 to 60 inches. Depth to bedrock is more than 40 inches. Coarse fragments of shale and limestone make up 0 to 15 percent of the solum and 20 to 75 percent of the C horizon. The soil ranges from strongly acid through neutral in the A horizon and upper part of the Bt horizon and from slightly acid through moderately alkaline in the lower part of the Bt horizon and in the C horizon.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. Some pedons have an A1 horizon with hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 through 4. The A horizon is loam, silt loam, or silty clay loam. The B1 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 8. The B2t horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 8. The lower part of the B2t horizon commonly has high-chroma mottles. Some pedons have low-chroma mottles below 40 inches. The B2t horizon is clay or silty clay. The C horizon has colors and mottles similar to those of the B2t horizon. It is shaly or very shaly silty clay loam, silty clay, or clay. Some pedons have secondary carbonate accumulations.

Fluvaquents

The Fluvaquents consist of moderately deep and deep, poorly drained and somewhat poorly drained soils on narrow flood plains and colluvial foot slopes in the foothills of the Blue Ridge Mountains. These soils formed in recent alluvial and colluvial materials derived mainly from shale, phyllite, and sandstone. Slope ranges from 0 to 8 percent.

Fluvaquents commonly are near the Cardiff and Laidig soils and the Udorthents. The Fluvaquents are more poorly drained than the other soils.

Because of the variability of this map unit, a typical pedon is not given. Thickness of unconsolidated sediments and depth to bedrock range from about 30 inches to more than 60 inches. Rock fragments of thin flat slate, phyllite, and shale and angular and rounded quartzites, sandstones, and metabasalts make up 0 to 90 percent of individual strata. Fluvaquents are strongly acid or medium acid except in areas that have been limed.

The surface layer dominantly has hue of 10YR through 5Y, value of 1 through 5, and chroma of 0 through 3. It is silt loam, loam, sandy loam, silty clay loam, clay loam, or sandy clay loam and the gravelly, very gravelly, cobbly, very cobbly, or stony analogs of those textures. The surface layer ranges from 4 to 20 inches thick.

The substratum dominantly has hue of 10YR through 5Y, value of 1 through 5, and chroma of 0 through 3. Some pedons are mottled in shades of brown, yellow, and red. Individual strata are silt loam, loam, sandy loam, silty clay loam, clay loam, or sandy clay loam and the gravelly, very gravelly, cobbly, or very cobbly analogs of those textures.

Hagerstown series

The Hagerstown series consists of deep and well drained soils on ridges and side slopes in the Shenandoah Valley. These soils formed in material weathered from limestone. Slope ranges from 3 to 15 percent.

The Hagerstown soils commonly are near the Duffield, Nicholson, Opequon, Swimley, and Timberville soils. The Hagerstown soils have more clay in the argillic horizon than the Duffield soils and a thinner surface layer than the Timberville soils. They do not have a fragipan as do the Nicholson soils, are deeper than the Opequon soils, and are more shallow than the Swimley soils.

Typical pedon of Hagerstown silt loam, in an area of Hagerstown-Opequon-Rock outcrop complex, 3 to 15 percent slopes, approximately 0.25 mile south-southeast of the junction of Virginia Highways 639 and 632 and

about 0.27 mile east-northeast of the junction of Virginia Highways 653 and 632:

Ap—0 to 6 inches; brown (7.5YR 5/4) silt loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; many wormholes, slightly acid; abrupt smooth boundary.
B1t—6 to 12 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; common thin clay films on faces of peds; many wormholes; many medium brown (7.5YR 5/4) worm castings of A horizon material; medium acid; gradual smooth boundary.
B21t—12 to 25 inches; yellowish red (5YR 5/8) silty clay loam; strong medium subangular blocky structure; friable, sticky, plastic; common fine roots; many medium clay films on faces of peds; few wormholes; strongly acid; diffuse smooth boundary.
B22t—25 to 49 inches; yellowish red (5YR 4/8) silty clay; strong medium subangular blocky structure; firm, sticky, plastic; common fine roots; common continuous thick clay films on faces of peds; strongly acid; clear smooth boundary.
C—49 to 52 inches; yellowish red (5YR 5/6) silty clay; massive; firm, sticky, plastic; few fine roots; many medium distinct light gray (N 6/0) highly weathered limestone fragments; neutral; abrupt wavy boundary.
R—52 inches; hard very dark gray (N 3/0) limestone bedrock.

The thickness of the solum ranges from 40 to 72 inches. Depth to hard limestone bedrock ranges from 40 to 60 inches and more. Coarse fragments of limestone and chert make up 0 to 15 percent of the solum. In unlimed areas the soil is very strongly acid or strongly acid in the A horizon and in the upper part of the Bt horizon. It ranges from strongly acid through neutral in the lower part of the Bt horizon and from neutral through moderately alkaline in the C horizon.

The A horizon has hue of 5YR through 10YR, value of 3 through 5, and chroma of 2 through 4. Value of 3 is limited to a thin A1 horizon. The A horizon is silt loam or silty clay loam. The B1 horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 through 8. It is silt loam, clay loam, or silty clay loam. The B2t horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 4 through 8. The subhorizons of some pedons have hue of 7.5YR. The B2t horizon is silty clay, clay, or silty clay loam. The C horizon has hue of 2.5YR through 10YR, value of 3 through 6, and chroma of 4 through 8. It is mottled in some pedons, and it ranges from loam or silt loam to clay or silty clay.

Hazleton series

The Hazleton series consists of deep and well drained soils on ridgetops and side slopes in the foothills of the Blue Ridge Mountains. These soils formed in materials weathered mainly from sandstone. Slope ranges from 3 to 15 percent.

The Hazleton soils commonly are near the Cardiff, Dekalb, Laidig, and Whiteford soils. The Hazleton soils have more sand than the Cardiff soils, have sandstone and quartzite fragments rather than slate fragments as do the Cardiff soils, and are deeper to bedrock than the Dekalb soils. They do not have a fragipan as do the Laidig soils, and they do not have as many channery fragments as the Whiteford soils.

Typical pedon of Hazleton channery sandy loam, in an area of Dekalb-Hazleton channery sandy loams, 3 to 15 percent slopes, approximately 0.3 mile southeast of the clubhouse on Shenandoah Retreat and 0.9 mile north-northeast of the junction of Virginia Highways 7 and 643:

O1—2 inches to 0; undecomposed and partially decomposed leaves and twigs.
A1—0 to 1 inch; very dark grayish brown (10YR 3/2) channery sandy loam; moderate fine granular structure; very friable; many fine to coarse roots; 35 percent sandstone fragments; strongly acid; clear smooth boundary.
A2—1 to 8 inches; yellowish brown (10YR 5/4) channery sandy loam; weak fine granular structure; friable; many fine to coarse roots; 35 percent sandstone fragments; strongly acid; gradual smooth boundary.
B21—8 to 14 inches; yellowish brown (10YR 5/6) channery sandy loam; weak fine subangular blocky structure; friable, slightly sticky; many fine and medium roots; 45 percent sandstone fragments; very strongly acid; gradual smooth boundary.
B22—14 to 20 inches; yellowish brown (10YR 5/8) channery sandy loam; weak fine subangular blocky structure; friable, slightly sticky; common fine and medium roots; 45 percent sandstone fragments; very strongly acid; gradual smooth boundary.
B23—20 to 29 inches; yellowish brown (10YR 5/6) channery sandy loam; weak fine subangular blocky structure; friable, slightly sticky; common fine and medium roots; 50 percent sandstone fragments; very strongly acid; gradual smooth boundary.
B3—29 to 35 inches; yellowish brown (10YR 5/6) very channery sandy loam; massive, friable; few fine roots; 70 percent sandstone fragments; very strongly acid; gradual smooth boundary.
C1—35 to 40 inches; pale brown (10YR 6/3) very channery sandy loam; massive; friable; few fine roots; 80 percent sandstone fragments; very strongly acid; gradual smooth boundary.
C2—40 to 60 inches; light yellowish brown (10YR 6/4) very channery sandy loam; massive; friable; 70 percent sandstone fragments; very strongly acid.

The thickness of the solum ranges from 25 to 50 inches. Depth to hard sandstone and quartzite bedrock

is more than 40 inches. Flat sandstone and quartzite fragments up to 15 inches long make up 20 to 70 percent of the A and B horizons and 50 to 80 percent or more of the C horizon. The soil ranges from extremely acid through strongly acid unless limed.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. Some pedons have an Ap horizon that has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A horizon is channery sandy loam or stony loam. The B horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 through 8. It is channery, very channery, flaggy, or very flaggy loam or sandy loam. Some pedons have a thin incipient Bir horizon. The C horizon is very channery or very flaggy sandy loam or loamy sand.

Hollywood series

The Hollywood series consists of deep and moderately well drained soils in depressions and along streams in the Shenandoah Valley. These soils formed in clayey alluvial sediments derived from limestone. Slope ranges from 0 to 4 percent.

The Hollywood soils are taxajuncts because they have a slightly lower mean annual soil temperature and grayer colors in the lower part of the AC horizon than is defined as the range for the series. This does not affect the use and management of the soils.

The Hollywood soils commonly are near the McGary, Pagebrook, Timberville, and Weaver soils. The Hollywood soils have a darker surface layer than the other soils.

Typical pedon of Hollywood clay loam, approximately 0.6 mile northeast of the junction of Virginia Highways 7 and 615 and about 100 feet east of the Norfolk & Western Railroad:

Ap—0 to 12 inches; black (10YR 2/1) clay loam; moderate fine and medium granular structure; friable, sticky, plastic; many fine and medium roots; 10 percent black and brown concretions; violent effervescence; mildly alkaline; diffuse smooth boundary.

A12—12 to 19 inches; black (10YR 2/1) silty clay; strong medium angular blocky structure; firm, sticky, plastic; common fine and medium roots; many slickensides that intersect; slight effervescence; moderately alkaline; clear smooth boundary.

AC1—19 to 25 inches; dark gray (10YR 4/1) clay; many medium distinct yellowish brown (10YR 5/4) mottles; moderate fine and medium subangular blocky structure; firm, sticky, plastic; common fine roots; many slickensides that intersect; slight effervescence; mildly alkaline; clear wavy boundary.

AC2ca—25 to 44 inches; light olive brown (2.5Y 5/4) clay; many medium faint grayish brown (2.5Y 5/2) mottles; moderate coarse subangular blocky structure; firm, sticky, plastic; common fine roots; 2 percent black and brown concretions; 5 percent secondary calcium carbonate concretions; many slickensides that intersect; slight effervescence; mildly alkaline; clear smooth boundary.

AC3ca—44 to 72 inches; gray (10YR 6/1) clay; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium and coarse subangular blocky structure; firm, sticky, plastic; 10 percent black and brown concretions; 5 percent secondary calcium carbonate concretions; 12 percent chert pebbles; common slickensides that intersect; slight effervescence; moderately alkaline.

Depth to slickensides that intersect ranges from 12 to 30 inches. Depth to the AC horizon ranges from 18 to 40 inches. Depth to secondary calcium carbonate accumulations or shells that effervesce with cold 10 percent hydrochloric acid ranges from 25 to 50 inches. Depth to limestone bedrock is more than 4 feet. Untilled soils have gilgai relief. The soil is mildly alkaline or moderately alkaline.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1. The upper part of the A1 horizon or the Ap horizon is clay loam, silty clay loam, or silty clay. The lower part of the A1 horizon is silty clay or clay. The AC horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 through 4. It is silty clay or clay. Soft powdery bodies of calcium carbonate and shells range from 2 to 20 percent of the volume. Some pedons have up to 25 percent black and brown concretions and up to 30 percent chert pebbles in subhorizons of the AC horizon.

Laidig series

The Laidig series consists of deep and well drained soils on concave colluvial fans and foot slopes in the Blue Ridge Mountains. These soils formed in loamy colluvial deposits derived mainly from sandstone. Slope ranges from 8 to 25 percent.

The Laidig soils commonly are near the Cardiff, Dekalb, Hazleton, and Whiteford soils. The Laidig soils have fewer rock fragments than the Cardiff, Dekalb, or Hazleton soils and more sand than the Whiteford soils.

Typical pedon of Laidig channery loam, 8 to 25 percent slopes, approximately 0.6 mile east of the junction of Virginia Highway 638 and the Warren-Clarke County line:

O1—2 inches to 0; undecomposed and partially decomposed leaves and twigs.

A1—0 to 2 inches; very dark gray (10YR 3/1) channery loam; moderate fine granular structure; very friable; mat of fine medium and coarse roots; 35 percent sandstone fragments; extremely acid; clear smooth boundary.

A2—2 to 14 inches; light yellowish brown (10YR 6/4) channery loam; weak fine granular structure; friable; many fine medium and coarse roots; 30 percent sandstone fragments; very strongly acid; clear smooth boundary.

B1—14 to 22 inches; yellowish brown (10YR 5/4) channery loam; many medium distinct light yellowish brown (2.5Y 6/4) mottles; weak fine subangular blocky structure; friable; many fine medium and coarse roots; few thin clay films on faces of peds; 25 percent sandstone fragments; very strongly acid; clear wavy boundary.

B2t—22 to 32 inches; yellowish brown (10YR 5/6) channery sandy clay loam; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and medium roots; common thin clay films on faces of peds; 25 percent sandstone fragments; very strongly acid; clear wavy boundary.

IIBx1—32 to 44 inches; yellowish brown (10YR 5/6) very channery sandy loam; polygons about 8 to 12 inches in diameter have weak medium platy structure; firm, 80 percent of the mass is brittle; common fine roots in polygonal cracks; many medium clay films in pores and cracks; 60 percent sandstone fragments; very strongly acid; clear smooth boundary.

IIBx2—44 to 60 inches; yellowish brown (10YR 5/4) channery sandy loam; common medium faint light yellowish brown (2.5Y 6/4) mottles; polygons about 8 to 12 inches in diameter have weak medium platy structure; firm, 80 percent of the mass is brittle; common fine roots in polygonal cracks; many medium clay films in pores and cracks; 15 percent sandstone fragments; very strongly acid; clear smooth boundary.

The thickness of the solum ranges from 60 to 80 inches or more. Depth to the fragipan ranges from 30 to 50 inches. Depth to bedrock is more than 5 feet. Coarse fragments of sandstone and quartzite make up 15 to 35 percent of the control section and 15 to 70 percent of individual subhorizons of the Bx horizon. The soil ranges from extremely acid through strongly acid unless limed.

The A1 horizon has hue of 10YR, value of 2 through 4, and chroma of 1 through 3. The A2 horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 through 6. The A horizon is channery loam or channery sandy loam. The B horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 8. The B1 horizon is channery analogs of sandy loam, fine sandy loam, or loam. The B2t horizon includes these textures and ranges to channery sandy clay loam. Some pedons have a thin incipient Bir horizon. The Bx horizon has hue of 5YR through 10YR, value of 4 or 5, and chroma of 3 through 8. It is channery or very channery analogs of sandy loam or loam. Some pedons have a C horizon that is variable stratified colluvial deposits.

Lakin series

The Lakin series consists of deep and excessively drained soils on river terraces adjacent to hills in the Shenandoah Valley. These soils formed in sandy alluvial eolin deposits. Slope ranges from 3 to 8 percent.

The Lakin soils commonly are near the Braddock, Monongahela, and Zoar soils. The Lakin soils have more sand than the other soils.

Typical pedon of Lakin loamy sand, 3 to 8 percent slopes, approximately 0.78 mile east of Virginia Highway 621 and 0.23 mile south of the Shenandoah River:

Ap—0 to 10 inches; brown (7.5YR 4/4) loamy sand; single grain; loose; many fine roots; many krotovinas; slightly acid; abrupt smooth boundary.

A2&Bt—10 to 50 inches; yellowish brown (10YR 5/4) loamy sand; single grain; loose (A2); about 10 percent dark yellowish brown (10YR 3/4) sandy loam lamellae; weak fine granular structure; friable, slightly sticky, slightly plastic; many sand grains bridged and coated with clay (Bt); few fine roots; common krotovinas; neutral; diffuse smooth boundary.

IIC1—50 to 61 inches; mottled yellowish brown (10YR 5/4), pale brown (10YR 6/3), and black (10YR 2/1) loam; massive; firm, slightly sticky, slightly plastic; many clay flows; 5 percent pebbles; neutral; diffuse smooth boundary.

IIIC2—61 to 70 inches; mottled yellowish brown (10YR 5/4), pale brown (10YR 6/3), and black (10YR 2/1) cobbly sandy loam; massive; firm, slightly sticky, slightly plastic; many clay flows; 30 percent cobblestones and pebbles; medium acid.

The thickness of the solum ranges from 40 to 80 inches or more. The thickness of the sandy deposits ranges from 50 inches to more than 60 inches. Depth to the uppermost lamellae is 10 to 25 inches. Depth to bedrock is more than 60 inches. Small pebbles make up 0 to 3 percent of the control section and 0 to 50 percent of the C horizon. Unlimed soils range from strongly acid through medium acid.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. Some pedons have an A1 horizon that has value of 2 or 3 and chroma of 2 or 3. The A horizon is fine sand or loamy sand. The A2 part of the A2&Bt horizon has matrix hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 through 6. It is sand or loamy sand. The Bt part consists of lamellae about 1/4 to 1 inch thick that have hue of 7.5YR or 10YR, value of

3 or 4, and chroma of 3 through 6 and are loamy sand or sandy loam. The total thickness of the lamellae is less than 6 inches. The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is variable.

Lew series

The Lew series consists of deep and well drained soils on concave foot slopes in the Blue Ridge Mountains. These soils formed in colluvial deposits derived mainly from greenstone. Slope ranges from 8 to 30 percent.

The Lew soils commonly are near the Catoctin, Dekalb, Laidig, and Myersville soils. They are deeper than the Catoctin or Dekalb soils, do not have a fragipan as do the Laidig soils, and have more rock fragments than the Myersville soils.

Typical pedon of Lew flaggy silt loam in an area of Lew very stony silt loam, 8 to 15 percent slopes, approximately 1.2 miles northwest of the junction of Clarke, Warren, and Fauquier Counties along the Clarke-Warren County line:

O1—2 inches to 0; undecomposed leaves and twigs and dark reddish brown (5YR 2/2) humus.

A1—0 to 1 inch; dark reddish brown (5YR 3/4) flaggy silt loam; strong medium granular structure; very friable, slightly sticky, slightly plastic; many fine roots; 35 percent greenstone fragments; strongly acid; abrupt smooth boundary.

A2—1 to 7 inches; reddish brown (5YR 4/4) flaggy silt loam; moderate fine and medium granular structure; friable, slightly sticky, slightly plastic; many fine and medium roots; 40 percent greenstone fragments; strongly acid; clear smooth boundary.

B1t—7 to 13 inches; reddish brown (5YR 4/4) flaggy silt loam; weak medium subangular blocky structure; friable slightly sticky, slightly plastic; many fine and medium roots; few thin clay films on faces of peds and coarse fragments; 45 percent greenstone fragments; very strongly acid; gradual wavy boundary.

B21t—13 to 26 inches; reddish brown (5YR 4/4) flaggy silty clay loam; weak medium subangular blocky structure; friable, slightly sticky, slighty plastic; common fine roots; few thin clay films on faces of peds and coarse fragments; 50 percent greenstone fragments; strongly acid; gradual wavy boundary.

IIB22t—26 to 42 inches; reddish brown (5YR 4/4) gravelly silty clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few thin clay films on faces of peds and coarse fragments; 50 percent greenstone fragments; strongly acid; gradual smooth boundary.

IIB23t—42 to 63 inches; reddish brown (5YR 4/4) very gravelly silty clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few thin clay films on faces of peds and coarse fragments; 60 percent greenstone fragments; medium acid.

The thickness of the solum ranges from 40 to 80 inches or more. Depth to bedrock is more than 5 feet. Coarse fragments of greenstone make up 25 to 50 percent of the A horizon and 35 to 70 percent of the B horizon. The soil ranges from very strongly acid through medium acid unless limed.

The A horizon has hue of 5YR through 10YR, value of 2 through 4, and chroma of 2 through 4. Only a thin A1 horizon has value of 2 or 3 and chroma of 2. The A horizon is flaggy or channery analogs of loam or silt loam. The B1 horizon has hue of 5YR through 10YR, value of 4 or 5, and chroma of 4 through 8. It is channery, very channery, flaggy, or very flaggy analogs of silt loam or loam. The B2t horizon has hue of 5YR through 10YR, value of 4 or 5, and chroma of 4 through 8. It is gravelly, very gravelly, channery, very channery, flaggy, or very flaggy analogs of silty clay loam or clay loam. A lithologic discontinuity is not evident in all pedons.

Lobdell series

The Lobdell series consists of deep and moderately well drained soils on flood plains in the Shenandoah Valley. These soils formed in loamy alluvium derived from granite, limestone, shale, sandstone, and greenstone. Slope ranges from 0 to 3 percent.

The Lobdell soils commonly are near the Buckton and Chagrin soils and the Udipsamments. The Lobdell soils are not as well drained as the Buckton or Chagrin soils and are not as sandy as the Udipsamments.

Typical pedon of Lobdell loam, in an area of Lobdell soils, approximately 2 miles southwest of Castleman's Ferry Bridge and 300 feet south of Virginia Highway 606:

Ap—0 to 9 inches; dark brown (10YR 4/3) loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; many krotovinas; medium acid; clear smooth boundary.

B21—9 to 17 inches; dark brown (10YR 4/3) loam; weak coarse prismatic structure parting to weak medium subangular blocky; friable, slightly sticky, slightly plastic; common fine roots; few thin dark grayish brown coatings on faces of peds in lower part; few thin black coatings on faces of peds; many krotovinas; neutral; gradual smooth boundary.

B22—17 to 26 inches; dark brown (10YR 4/3) loam; many medium faint dark grayish brown (10YR 4/2) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; friable, slightly sticky, slightly plastic, common fine roots; many medium dark grayish brown coatings on faces of peds; common thin black coatings on faces of peds; common krotovinas; slightly acid; diffuse smooth boundary.

C—26 to 64 inches; dark yellowish brown (10YR 4/4) loam; many medium distinct grayish brown (2.5Y 5/2) mottles; massive; friable, slightly sticky, slightly plastic; few fine roots; common medium black coatings; common krotovinas; medium acid.

The thickness of the solum ranges from 24 to 40 inches. Depth to bedrock is more than 5 feet. Coarse fragments make up 0 to 5 percent of the A horizon and 0 to 15 percent of the B horizon and C horizon. The soil ranges from strongly acid through neutral in the A and B horizons and from medium acid through neutral in the C horizon.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 through 3. Value and chroma of 3 or less are confined to an A horizon less than 10 inches thick. The A horizon is fine sandy loam, sandy loam, loam, or silt loam. The B horizon has hue of 7.5YR through 2.5Y, value of 4 or 5, and chroma of 3 or 4. Some pedons have thin layers with value of 3 and chroma of 2. The B horizon is silt loam, silty clay loam, loam, clay loam, or sandy loam. The C horizon has hue of 10YR through 5Y, value of 4 through 6, and chroma of 2 through 8. It is loam, silt loam, sandy loam, clay loam, sandy clay loam, or fine sand. Some pedons have gravel and cobblestones, and some pedons are stratified.

McGary series

The McGary series consists of deep and somewhat poorly drained soils in depressions and along streams in the Shenandoah Valley. These soils formed in clayey alluvial sediments derived from limestone. Slope ranges from 0 to 3 percent.

The McGary soils commonly are near the Hollywood, Pagebrook, Timberville, and Weaver soils. They have a lighter colored surface layer than the Hollywood soils and are more poorly drained than the Hollywood, Pagebrook, Timberville, or Weaver soils.

Typical pedon of McGary silty clay loam, approximately 0.15 mile east-southeast of the junction of Opequon Creek and Virginia Highway 664:

Ap—0 to 9 inches; grayish brown (10YR 5/2) silty clay loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; neutral; abrupt smooth boundary.

B21tg—9 to 14 inches; mottled light gray (10YR 6/1) and yellowish brown (10YR 5/8) clay loam; moderate medium and coarse subangular blocky structure; firm, sticky, plastic; few fine roots; many medium clay films on faces of peds; 10 percent black and brown concretions; neutral; clear smooth boundary.

B22tg—14 to 26 inches; gray (10YR 6/1) clay; many medium distinct yellowish brown (10YR 5/8) mottles; moderate medium and coarse subangular blocky structure; firm, sticky, plastic; few fine roots; continuous medium clay films on faces of peds; mildly alkaline; clear smooth boundary.

B23tg—26 to 33 inches; gray (10YR 6/1) clay; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; few fine roots; continuous medium clay films on faces of peds; 15 percent black and brown concretions; 5 percent shale fragments; mildly alkaline; clear smooth boundary.

B3tg—33 to 42 inches; light brownish gray (2.5Y 6/2) clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; few fine roots; many medium clay films on faces of peds; 1 percent black and brown concretions; 2 percent shale fragments; mildly alkaline; clear smooth boundary.

Cg—42 to 60 inches; light brownish gray (2.5Y 6/2) clay loam; many medium distinct yellowish brown (10YR 5/8) mottles; massive; firm, sticky, plastic; 1 percent black and brown concretions; 15 percent shale fragments; mildly alkaline.

The thickness of the solum ranges from 24 to 50 inches. The soil is neutral or mildly alkaline in the A horizon and upper part of the B horizon and ranges from slightly acid to moderately alkaline in the lower part of the B horizon and in the C horizon.

The Ap horizon has hue of 10YR, value of 4 through 6, and chroma of 1 through 3. It is silty clay loam or silt loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 through 4. The Bt horizon is clay, silty clay, silty clay loam, or clay loam. The C horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 through 3. It is clay, silty clay, silty clay loam, or clay loam. Some pedons contain secondary carbonate accumulations.

Monongahela series

The Monongahela series consists of deep and moderately well drained soils on high river terraces in the Shenandoah Valley. These soils formed in alluvial sediments derived mainly from crystalline rocks. Slope ranges from 3 to 15 percent.

The Monongahela soils commonly are near the Braddock, Thurmont, and Zoar soils. They have less clay

than the Braddock soils and are not as red. They have a fragipan, which is not characteristic of the Braddock, Thurmont, or Zoar soils.

Typical pedon of Monongahela loam, 3 to 8 percent slopes, approximately 0.85 mile south of the junction of Spout Run and Virginia Highway 621, 20 feet north of Highway 621 (fig. 10):

Ap—0 to 9 inches; brown (10YR 4/3) loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine and medium roots; 5 percent pebbles and cobblestones; mildly alkaline; clear smooth boundary.

B2t—9 to 21 inches; yellowish brown (10YR 5/4) loam; many medium distinct pale brown (10YR 6/3) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and medium roots; common thin clay films on faces of peds; 2 percent pebbles and cobblestones; slightly acid; clear smooth boundary.

Bx1—21 to 31 inches; light yellowish brown (10YR 6/4) clay loam; moderate medium platy structure; firm, 80 percent of the mass is brittle, slightly sticky, slightly plastic; few fine roots in cracks; many medium clay films mostly on horizontal faces of peds; many dark yellowish brown (10YR 4/4) coatings; 10 percent pebbles and cobblestones; very strongly acid; gradual smooth boundary.

Bx2—31 to 45 inches; yellowish brown (10YR 5/4) clay loam; moderate medium platy structure; firm, 80 percent of the mass is brittle, slightly sticky, slightly plastic; many medium clay films on both horizontal and vertical faces of peds; many dark brown (7.5YR 3/2) coatings; 1 percent pebbles; very strongly acid; diffuse smooth boundary.

Bx3—45 to 60 inches; strong brown (7.5YR 5/8) clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; weak medium and thick platy structure; firm, 80 percent of the mass is brittle, slightly sticky, slightly plastic; common medium clay films mostly on horizontal faces of peds; 1 percent pebbles; very strongly acid.

The thickness of the solum ranges from 40 to 72 inches. Depth to the fragipan ranges from 18 to 30 inches. Depth to bedrock is more than 5 feet. Pebbles and cobblestones make up 0 to 30 percent of the soil above the fragipan and 0 to 35 percent of the fragipan. Some pedons have a C horizon that is 10 to 40 percent cobblestones and pebbles. The soil is very strongly acid or strongly acid unless limed.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. A thin A1 horizon, when present, has value and chroma of 3 or 4. The A horizon is loam, silt loam, sandy loam, or the cobbly analogs of those textures. The B2t horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 8. It is silt

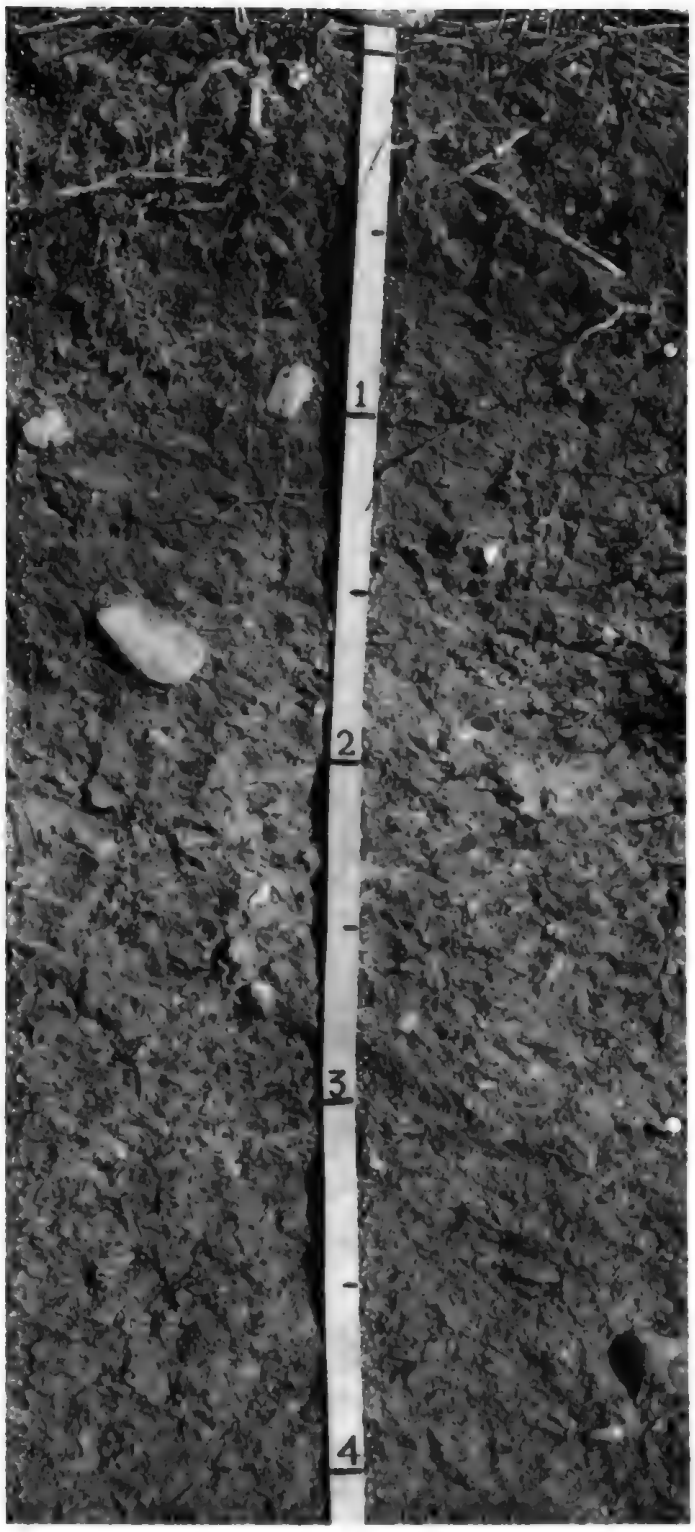


Figure 10.—Profile of Monongahela loam, 3 to 8 percent slopes, shows a firm, brittle fragipan below 22 inches. Scale is in feet.

loam, loam, clay loam, silty clay loam, or the cobbly analogs of those textures. The Bx horizon has hue of 7.5YR through 2.5Y, value of 5 or 6, and chroma of 2 through 8. It is loam, silt loam, clay loam, silty clay loam, or the gravelly or cobbly analogs of those textures. Some pedons have a C horizon that has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 2 through 8. It is sandy loam, loam, silt loam, sandy clay loam, clay loam, silty clay loam, or the gravelly or cobbly analogs of those textures.

Myersville series

The Myersville series consists of deep and well drained soils on ridges and side slopes in the Blue Ridge Mountains. These soils formed in materials weathered mainly from greenstone. Slope ranges from 3 to 45 percent.

The Myersville soils commonly are near the Catoctin, Dekalb, Laidig, and Lew soils. They have fewer rock fragments than the Catoctin, Dekalb, and Lew soils. They do not have a fragipan as do the Laidig soils.

Typical pedon of Myersville silt loam, in an area of Myersville-Catoctin silt loams, 3 to 8 percent slopes, approximately 2 miles northeast of the junction of Virginia Highway 601 and U.S. Highways 17 and 50, 100 feet east of Highway 601:

O1—2 inches to 0; undecomposed and partially decomposed leaves and twigs.

A11—0 to 5 inches; dark reddish brown (5YR 3/3) silt loam; moderate fine granular structure; very friable, many fine medium and coarse roots; 10 percent greenstone fragments; medium acid; gradual smooth boundary.

A12—5 to 10 inches; dark reddish brown (5YR 3/4) silt loam; moderate fine granular structure; very friable; many fine medium and coarse roots; 5 percent greenstone fragments; strongly acid; clear smooth boundary.

B1t—10 to 17 inches; reddish brown (5YR 4/4) clay loam; moderate fine granular and weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; many fine and medium roots; few thin clay films on faces of peds; 10 percent greenstone fragments; strongly acid; clear smooth boundary.

B2t—17 to 35 inches; yellowish red (5YR 4/6) clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; common thin clay films on faces of peds; 15 percent greenstone fragments; strongly acid; gradual smooth boundary.

IIB3t—35 to 47 inches; yellowish red (5YR 5/6) channery clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common thin clay films on faces of peds; 30 percent highly weathered olive gray greenstone schist fragments; strongly acid; gradual smooth boundary.

IIC—47 to 62 inches; yellowish red (5YR 5/6) very channery clay loam; massive; friable, slightly sticky, slightly plastic; few thin clay films on schist fragments; 70 percent highly weathered greenstone schist fragments; strongly acid.

The thickness of the solum ranges from 20 to 50 inches. Depth to rippable bedrock is more than 40 inches. Depth to hard bedrock is more than 60 inches. Weathered greenstone fragments make up 0 to 35 percent of the A horizon and upper part of the B horizon, 0 to 50 percent of the lower part of the B horizon, and 50 to 70 percent of the C horizon. The soil is strongly acid or medium acid unless limed.

The A horizon has hue of 5YR through 10YR, value of 2 through 5, and chroma of 2 through 4. Horizons with value of 2 or 3 and chroma of 2 or 3 are less than 7 inches thick. The A horizon is silt loam or loam or the channery analogs of those textures. The Bt horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 4 through 8. It is clay loam, silty clay loam, silt loam, or the channery analogs of those textures. In many pedons the C horizon is multicolored in shades of brown, red, yellow, gray, or black that are inherited from the bedrock. It is very channery silt loam, very channery clay loam, or very channery loam.

Nicholson series

The Nicholson series consists of deep and moderately well drained soils on ridges in the Shenandoah Valley. These soils formed in silty colluvial, alluvial, or eolian sediments. Slope ranges from 3 to 8 percent.

The Nicholson soils commonly are near the Duffield, Hagerstown, Poplimento, and Timberville soils. The Nicholson soils have more silt than the other soils.

Typical pedon of Nicholson silt loam, in an area of Nicholson-Duffield silt loams, 3 to 8 percent slopes, approximately 0.9 mile east of the junction of U.S. Highway 340 and Virginia Highway 611 and 0.5 mile north-northwest of the junction of the Norfolk and Western Railroad and Highway 615 (fig. 11):

Ap—0 to 10 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine granular structure; very friable, slightly sticky, slightly plastic; many fine roots; slightly acid; abrupt smooth boundary.

B2t—10 to 23 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine

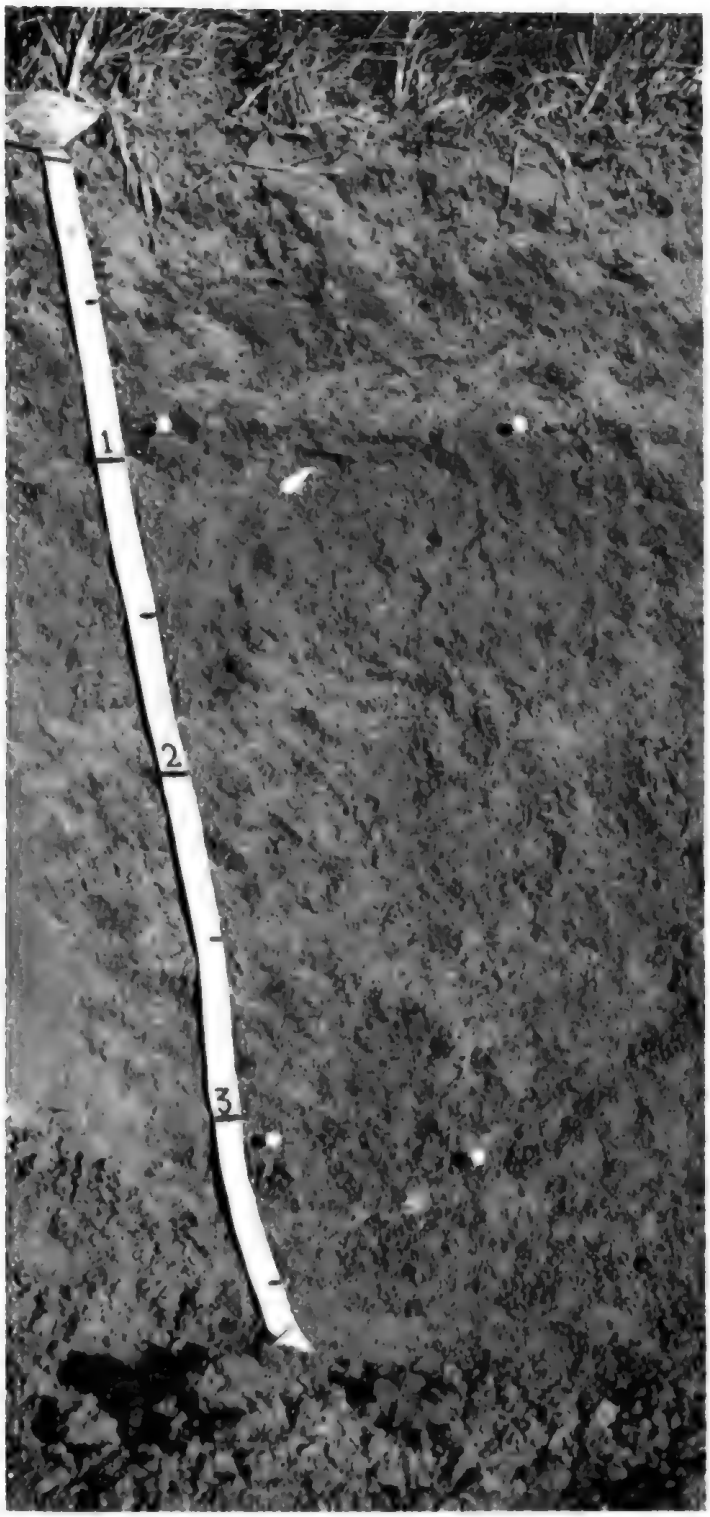


Figure 11.—Profile of Nicholson silt loam in an area of Nicholson-Duffield silt loams, 3 to 8 percent slopes. This soil has a fragipan from 23 to 26 inches and a buried subsoil below 36 inches. Scale is in feet.

roots; common thin clay films on faces of peds; slightly acid; clear smooth boundary.

Bx—23 to 36 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct very dark gray (10YR 3/1) mottles; moderate medium platy structure; firm, 80 percent of the mass is brittle, slightly sticky, slightly plastic; many medium clay films on faces of peds; many medium faint dark yellowish brown (10YR 4/4) coatings; medium acid; clear wavy boundary.

IIB3t—36 to 60 inches; yellowish red (5YR 4/6) silty clay; moderate medium subangular blocky structure; friable, sticky, plastic; many medium clay films on faces of peds; many coarse distinct black (N 2/0) stains; medium acid.

The thickness of the solum ranges from 40 to 72 inches. Depth to the fragipan ranges from 20 to 30 inches. Depth to limestone, calcareous shale, or siltstone is more than 5 feet. Except where limed, the soil ranges from very strongly acid through medium acid through the fragipan and from strongly acid through mildly alkaline below the fragipan.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 through 4. The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 through 6. It is silt loam or silty clay loam. The Bx horizon has hue of 7.5YR through 2.5Y, value of 3 through 5, and chroma of 4 through 8. It has few to many mottles with chroma of 2 or less. The Bx horizon is silt loam or silty clay loam. The IIB3t horizon has hue of 2.5YR through 2.5Y, value of 4 or 5, and chroma of 4 through 6. The IIB3t horizon is silty clay or clay. Some pedons have a IIC horizon with color and texture similar to those of the IIB3t horizon. The IIC horizon is 0 to 35 percent weathered siltstone or shale fragments.

Oaklet series

The Oaklet series consists of deep and well drained soils on ridges and side slopes in the Shenandoah Valley. These soils formed in materials weathered from mainly limestone. Slope ranges from 3 to 8 percent.

The Oaklet soils commonly are near the Carbo, McGary, Opequon, and Pagebrook soils. They are deeper to bedrock than the Carbo or Opequon soils, are better drained than the McGary soils, and have more clay than the Pagebrook soils.

Typical pedon of Oaklet silt loam in an area of Oaklet-Carbo complex, rocky, 3 to 8 percent slopes, approximately 0.7 mile southwest of the junction of U.S. Highways 17 and 50 and Virginia Highway 644 and 0.2 mile east of Highway 644:

Ap—0 to 7 inches; dark yellowish brown (10YR 4/4) silt loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate fine granular structure; friable, sticky, plastic; many fine and medium roots; 1 percent iron manganese concretions; neutral; abrupt wavy boundary.

B21t—7 to 17 inches; strong brown (7.5YR 5/6) clay; strong fine and medium subangular blocky structure; firm, very sticky, very plastic; common fine and medium roots; many medium clay films on faces of peds; slightly acid; diffuse smooth boundary.

B22t—17 to 27 inches; strong brown (7.5YR 5/6) clay; strong fine and medium subangular blocky structure; firm, very sticky, very plastic; few fine roots; continuous medium clay films on faces of peds; strongly acid; diffuse smooth boundary.

B23t—27 to 42 inches; strong brown (7.5YR 5/6) clay; many medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to strong medium subangular and angular blocky; firm, very sticky, very plastic; few fine roots; continuous medium clay films on faces of peds; strongly acid; diffuse smooth boundary.

B24t—42 to 60 inches; strong brown (7.5YR 5/6) clay; many medium distinct yellowish brown (10YR 5/6) and very pale brown (10YR 7/3) mottles; moderate coarse prismatic structure parting to strong medium subangular and angular blocky; firm, very sticky, very plastic; continuous medium clay films on faces of peds; strongly acid; diffuse smooth boundary.

B25t—60 to 90 inches; strong brown (7.5YR 5/6) clay; many medium distinct light gray (10YR 7/1) and yellowish red (5YR 4/8) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm, very sticky, very plastic; many medium clay films on faces of peds; common slickensides; strongly acid.

The thickness of the solum is more than 60 inches. Depth to hard limestone bedrock is more than 5 feet. Chert fragments make up 0 to 35 percent of the A horizon and 0 to 15 percent of the upper part of the B2t horizon. Some pedons have secondary carbonate accumulations in the lower part of the B2t horizon. The soil ranges from very strongly acid through slightly acid in the A horizon and in the upper part of the Bt horizon, unless limed, and from strongly acid through moderately alkaline in the lower part of the Bt horizon.

The Ap horizon has hue of 10YR, value of 4 through 6, and chroma of 3 through 6. It is silt loam, silty clay loam, or the cherty analogs of those textures. The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 8. Mottles with chroma of 2 or less are below 40 inches.

Opequon series

The Opequon series consists of shallow and well drained soils on ridges and side slopes in the Shenandoah Valley. These soils formed in materials weathered mainly from limestone. Slope ranges from 3 to 15 percent.

The Opequon soils commonly are near the Carbo, Hagerstown, McGary, Oaklet, and Pagebrook soils. The Opequon soils are shallower to bedrock than the other soils.

Typical pedon of Opequon silty clay in an area of Carbo-Opequon-Rock outcrop complex, 8 to 15 percent slopes, approximately 200 feet northeast of the junction of Clarke, Warren, and Frederick Counties and 75 feet east of U.S. Highway 340:

Ap—0 to 8 inches; dark yellowish brown (10YR 3/4) silty clay; moderate medium and fine granular structure; friable, sticky, plastic; many fine and medium roots; 10 percent limestone fragments up to 6 inches long; neutral; clear smooth boundary.

B2t—8 to 17 inches; brown (7.5YR 5/4) clay; strong fine subangular blocky structure; firm, very sticky, very plastic; common fine and medium roots; many fine and medium pores; medium continuous clay films or slickensides on faces of peds; common black coatings; 5 percent flat limestone fragments up to 6 inches long; mildly alkaline; abrupt wavy boundary.

R—17 inches; very dark gray (10YR 3/1) limestone coated with light gray (10YR 7/1) clay films.

The thickness of the solum and depth to limestone bedrock range from 12 to 20 inches. Coarse fragments of limestone make up 0 to 35 percent of the soil. The soil ranges from medium acid through mildly alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 1 through 4. It is clay, silty clay, or silty clay loam. The B2t horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 through 8. It is clay or silty clay. Some pedons have a C horizon 1 to 3 inches thick that effervesces in diluted hydrochloric acid.

Pagebrook series

The Pagebrook series consists of deep and moderately well drained soils in depressions and along drainageways in the Shenandoah Valley. These soils formed in clayey alluvial sediments derived from limestone. Slope ranges from 0 to 7 percent.

The Pagebrook soils commonly are near the Hollywood, McGary, Timberville, and Weaver soils. They have a lighter colored surface than the Hollywood soils, are better drained than the McGary soils, and have more clay than the Timberville or Weaver soils.

Typical pedon of Pagebrook silty clay loam, 0 to 7 percent slopes, approximately 0.3 mile west-northwest of

the junction of U.S. Highway 340 and Taylor Street in Berryville:

Ap—0 to 8 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium granular structure; friable, slightly sticky, slightly plastic; many fine roots; 5 percent black and brown concretions; 2 percent chert fragments; medium acid; abrupt smooth boundary.

B21—8 to 16 inches; dark brown (7.5YR 4/4) clay; weak fine and medium subangular blocky structure; very firm, sticky, plastic; common fine roots; common slickensides; 7 percent black and brown concretions; 2 percent chert fragments; medium acid; clear smooth boundary.

B22—16 to 26 inches; dark brown (7.5YR 4/4) clay; many medium distinct brownish yellow (10YR 6/6) mottles; weak coarse subangular blocky structure; very firm, sticky, very plastic; common fine roots; many slickensides; 10 percent black concretions; 5 percent highly weathered siltstone fragments; strongly acid; gradual smooth boundary.

B3—26 to 57 inches; yellowish brown (10YR 5/8) clay; common medium distinct light olive brown (2.5Y 5/4) and few medium distinct light gray (10YR 7/1) mottles; moderate medium subangular blocky structure; very firm, sticky, very plastic; few fine roots; many slickensides; 10 percent black concretions; 3 percent chert fragments; slightly acid; gradual smooth boundary.

Cca—57 to 92 inches; yellowish brown (10YR 5/6) clay; many medium distinct pale brown (10YR 6/3), light gray (10YR 7/1), and pale yellow (2.5Y 7/4) mottles; massive; firm, sticky, very plastic; common slickensides; 15 percent lime concretions that effervesce with cold 10 percent hydrochloric acid; 3 percent black concretions; mildly alkaline; abrupt smooth boundary.

R—92 inches; hard limestone.

The thickness of the solum is 40 to 60 inches or more. Depth to limestone bedrock is more than 60 inches. Chert fragments and iron and manganese concretions make up 0 to 10 percent of the Ap horizon, 0 to 35 percent of the control section, and up to 55 percent of individual subhorizons of the Bt horizon. Some pedons have secondary lime concretions in the lower part of the Bt horizon. The soil ranges from strongly acid through mildly alkaline in the A horizon and upper part of the B horizon and from slightly acid through moderately alkaline in the lower part of the B horizon and in the C horizon.

The Ap horizon has hue of 7.5YR or 10YR and has value and chroma of 3 to 6. It is silty clay loam, clay, or silt loam. The B horizon has hue of 5YR through 10YR, value of 3 through 5, and chroma of 3 through 8. Mottles with chroma of 2 or less are below 24 inches. The B horizon is clay loam, silty clay loam, silty clay, or clay. The C horizon is similar in matrix color, mottles, and texture range to the Bt horizon.

Poplimento series

The Poplimento series consists of deep and well drained soils on ridges and side slopes in the Shenandoah Valley. These soils formed in material weathered from a heterogeneous mixture of limestone, shale, and siltstone (fig. 12). Slope ranges from 3 to 35 percent.

The Poplimento soils commonly are near the Duffield, Nicholson, Timberville, and Webbtown soils. The Poplimento soils have more clay in the subsoil than the Duffield or Timberville soils, do not have a fragipan as do the Nicholson soils, and have fewer shale fragments in the subsoil than the Webbtown soils.

Typical pedon of Poplimento silt loam, in an area of Poplimento-Webbtown complex, 3 to 8 percent slopes, approximately 0.17 mile north of the junction of Virginia Highways 609 and 612, 200 feet east of Highway 612:

Ap—0 to 9 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and medium granular structure; very friable, slightly sticky, slightly plastic; many fine and medium roots; many fine and medium pores; 3 percent dark oxide concretions; medium acid; clear smooth boundary.

B21t—9 to 17 inches; strong brown (7.5YR 5/6) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium and fine subangular blocky structure; firm, sticky, plastic; common fine roots; many fine and medium pores; common thick patchy clay films on faces of peds; 2 percent dark oxide concretions; 2 percent shale and siltstone fragments; strongly acid; clear smooth boundary.

B22t—17 to 36 inches; strong brown (7.5YR 5/6) clay; many medium distinct brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; few fine roots; many fine and medium pores; common thick continuous clay films on faces of peds; common 1- to 2-inch slickensides; 10 percent shale and siltstone fragments; medium acid; diffuse smooth boundary.

B23t—36 to 58 inches; strong brown (7.5YR 5/6) shaly silty clay; weak medium and coarse subangular blocky structure; firm, sticky, plastic; many fine and medium pores; common thick continuous clay films on faces of peds; common 1- to 2-inch slickensides; common black coatings; 25 percent shale and siltstone fragments; slightly acid; diffuse smooth boundary.

Figure 12.—Rock outcrop in an area of Poplimento silt loam, 3 to 8 percent slopes, shows dark-colored crinkly siliceous laminae embedded in light-colored limestone.

C—58 to 73 inches; strong brown (7.5YR 5/6) shaly silty clay; massive; firm, sticky, plastic; many fine and medium pores; 45 percent shale and siltstone fragments; slightly acid.

The thickness of the solum ranges from 40 to 60 inches. Depth to hard limestone, shale, or siltstone bedrock is more than 4 feet and varies greatly over short horizontal distances. Highly weathered coarse fragments, commonly shale and porous siltstone that has very low density and is easily crushed, make up 0 to 15 percent of the A horizon and upper part of the B horizon and 0 to 50 percent of the lower part of the B horizon and the C horizon. The soil ranges from very strongly acid through medium acid in the A horizon and upper part of the B horizon and from strongly acid through slightly acid in the lower part of the B horizon and in the C horizon.

The Ap horizon has hue of 7.5YR or 10YR and value and chroma of 3 through 6. Horizons with value and chroma of 3 are less than 7 inches thick. The Ap horizon is loam, silt loam, or silty clay loam.

The Bt horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 4 through 8. The upper part of the Bt horizon is clay, silty clay, or silty clay loam, and the lower part is shaly silty clay, shaly silty clay loam, silty clay, or clay.

The C horizon has colors similar to those of the Bt horizon. It is shaly silty clay, shaly silty clay loam, very shaly silty clay, or very shaly silty clay loam. Some pedons have a C horizon with reddish brown or dusky red colors.

Swimley series

The Swimley series consists of deep and well drained soils on ridges in the Shenandoah Valley. These soils formed in material weathered from limestone. Slope ranges from 3 to 15 percent.

The Swimley soils commonly are near the Hagerstown, McGary, Pagebrook, and Poplimento soils. They are deeper to bedrock than the Hagerstown soils, are redder

than the Poplimento soils, and are better drained than the McGary or Pagebrook soils.

Typical pedon of Swimley silt loam, rocky, 3 to 8 percent slopes, approximately 0.3 mile west of the junction of Virginia Highways 761 and 661, 300 feet south of Highway 761:

Ap—0 to 9 inches; reddish brown (5YR 4/4) silt loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; 5 percent chert fragments; neutral; abrupt smooth boundary.

B1t—9 to 14 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular blocky structure and moderate fine granular structure; friable, sticky, plastic; common fine roots; many medium clay films on faces of peds; 1 percent chert pebbles; medium acid; clear smooth boundary.

B21t—14 to 29 inches; red (2.5YR 4/6) clay; strong fine and medium angular blocky structure; firm, sticky, plastic; common fine roots; continuous medium clay films on faces of peds; strongly acid; gradual smooth boundary.

B22t—29 to 55 inches; red (2.5YR 4/6) clay; strong fine and medium angular blocky structure; firm, sticky, plastic; few fine roots; continuous medium clay films on faces of peds; very strongly acid; diffuse smooth boundary.

B23t—55 to 99 inches; red (2.5YR 4/6) clay; few medium distinct light brownish gray (10YR 6/2) and reddish brown (5YR 4/4) mottles; moderate medium and fine subangular blocky structure; firm, sticky, plastic; many medium clay films on faces of peds; very strongly acid.

The thickness of the solum is more than 60 inches. Depth to bedrock is more than 5 feet. Chert fragments make up 0 to 10 percent of the A horizon and upper part of the B horizon and 5 to 50 percent of the B3 horizon and the C horizon, where present. The solum ranges from very strongly acid through neutral unless limed.

The Ap horizon has hue of 5YR through 10YR, value of 4 or 5, and chroma of 3 through 5. It is silt loam or silty clay loam. In eroded areas it is clay. The B1 horizon has hue of 2.5YR through 7.5YR, value of 4 or 5, and chroma of 3 through 8. It is silty clay loam, silty clay, or clay. The B2t horizon has hue of 10R to 5YR, value of 4 or 5, and chroma of 4 to 8. Some subhorizons have a value of 3. Some pedons are not mottled. Some pedons have B3 and C horizons that have hue of 10R through 7.5YR, value of 4 through 7, and chroma of 4 through 8. Mottles with chroma of 2 or less are in some pedons. The B3 and C horizons are clay.

Thurmont series

The Thurmont series consists of deep and well drained soils on stream terraces in the Shenandoah Valley. These soils formed in loamy alluvial sediments derived mainly from crystalline rocks. Slope ranges from 3 to 8 percent.

The Thurmont soils commonly are near the Braddock, Monongahela, and Zoar soils. They have less clay than the Braddock soils and are not so red. They do not have a fragipan as do the Monongahela soils, and they are better drained than the Zoar soils.

Typical pedon of Thurmont loam, 3 to 8 percent slopes, approximately 0.3 mile west-northwest of Virginia Highway 638 and 0.5 mile northeast of the junction of Highway 638 and the Clarke-Warren County line:

Ap—0 to 13 inches; brown (10YR 4/3) loam; fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; strongly acid; abrupt smooth boundary.

B1t—13 to 19 inches; brown (7.5YR 4/4) loam; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; common thin clay films on faces of peds; common thin black (10YR 2/1) coatings on peds; strongly acid; gradual smooth boundary.

B21t—19 to 33 inches; brown (7.5YR 4/4) clay loam; weak medium subangular blocky structure; friable, sticky, plastic; few fine roots; many medium clay films on faces of peds; common medium distinct black (10YR 2/1) coatings on peds; strongly acid; gradual smooth boundary.

B22t—33 to 48 inches; yellowish red (5YR 4/6) clay loam; many medium distinct light yellowish brown (10YR 6/4) mottles; moderate fine and medium subangular blocky structure; friable, sticky, plastic; continuous medium clay films on faces of peds; many medium black (10YR 2/1) coatings on peds; 2 percent pebbles; very strongly acid; gradual smooth boundary.

B3t—48 to 58 inches; yellowish red (5YR 4/6) sandy clay loam; common medium distinct strong brown (7.5YR 5/6) and light gray (10YR 6/1) mottles; weak medium and thick platy structure parting to moderate fine subangular blocky; friable, slightly sticky, slightly plastic; many medium clay films on faces of peds; strongly acid; diffuse smooth boundary.

IIC—58 to 68 inches; yellowish red (5YR 4/6) sandy clay loam; common medium distinct light gray (10YR 6/1) and black (10YR 2/1) mottles; massive; friable, brittle in about 30 percent of the mass, slightly sticky, slightly plastic; common medium black coatings; very strongly acid.

The thickness of the solum ranges from 30 to 60 inches. Depth to bedrock is more than 5 feet. Pebbles and cobblestones make up 0 to 50 percent of the A horizon and 0 to 35 percent of the Bt and C horizons. The soil is very strongly acid or strongly acid unless limed.

The A horizon has hue of 7.5YR through 2.5Y, value of 4 or 5, and chroma of 2 through 6. It is sandy loam, fine sandy loam, loam, or the gravelly analogs of those textures. The B1 and B2t horizons have hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. They are loam, clay loam, sandy clay loam, or the gravelly analogs of those textures. The B3 horizon has matrix colors similar to those of the B2t horizon. Mottles with chroma of 2 or less are in most pedons. It is sandy loam, loam, sandy clay loam, or the cobbly or gravelly analogs of those textures. The C or IIC horizon has variable colors and variable textures that range from sandy loam to clay or the gravelly or cobbly analogs of those textures.

Timberville series

The Timberville series consists of deep and well drained soils at the heads of drainageways or in low areas adjacent to upland drainageways in the Shenandoah Valley. These soils formed in loamy colluvial and alluvial sediments derived from limestone, shale, and siltstone. Slope ranges from 0 to 7 percent.

The Timberville soils commonly are near the Hollywood, McGary, Pagebrook, and Weaver soils. They have less clay than the Hollywood soils, are better drained than the McGary or Pagebrook soils, and are more acid than the Weaver soils.

Typical pedon of Timberville silt loam, 0 to 7 percent slopes, approximately 0.27 mile south of the junction of Virginia Highways 636 and 7 and about 800 feet west of Highway 636:

Ap—0 to 9 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine and medium roots; 2 percent iron concretions; 2 percent pebbles; slightly acid; clear smooth boundary.

B2—9 to 21 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; 1 percent iron concretions; 1 percent pebbles; slightly acid; gradual smooth boundary.

Ab—21 to 31 inches; dark brown (10YR 3/3) silt loam; weak medium subangular blocky structure parting to weak fine granular; friable, slightly sticky, slightly plastic; many fine roots; 1 percent iron concretions; 1 percent pebbles; medium acid; clear smooth boundary.

IIB2tb—31 to 52 inches; yellowish red (5YR 4/6) clay loam; moderate medium and fine subangular blocky structure; friable, sticky, plastic; few fine roots; many medium clay films on faces of peds; medium acid; clear smooth boundary.

IIB3tb—52 to 81 inches; yellowish red (5YR 5/6) clay; many medium distinct brownish yellow (10YR 6/6) mottles; weak medium subangular blocky structure; friable, sticky, plastic; many medium clay films on faces of peds; medium acid.

The thickness of the solum and depth to bedrock are more than 60 inches. Depth to the IIBt horizon is 20 to 40 inches. Coarse fragments of chert and sandstone make up 0 to 35 percent of the A horizon and the control section and from 0 to 60 percent of individual subhorizons in the solum. The soil ranges from very strongly acid through medium acid unless limed.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 through 5. It is silt loam, loam, or the cherty analogs of those textures. The B2 horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 8. It is silt loam, silty clay loam, clay loam, or the cherty analogs of those textures. Most pedons have an Ab horizon that has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 through 4. It is silt loam, loam, or the cherty analogs of those textures. The IIBt horizon has hue of 5YR through 10YR, value of 4 or 5, and chroma of 4 through 8. It is clay loam, clay, silty clay, or silty clay loam.

Udalfs

Udalfs consist of moderately deep or deep, well drained soils on escarpments between flood plains and high terraces. These soils formed mainly in residual materials weathered from the heterogeneous mixture of limestone, shale, siltstone, quartzite, and sandstone. They also formed in alluvium derived from sandstone, shale, slate, and granite. The alluvium was deposited over the limestone, shale, siltstone, and sandstone, and the subsequent downcutting by streams produced steep escarpments. These escarpments are a mixture of the residual and alluvial materials. Slope ranges from 15 to 45 percent.

Udalfs commonly are near the Braddock, Chagrin, Lobdell, Monongahela, Poplimento, Thurmont, Webbtown, and Udults soils. The Braddock, Monongahela, and Thurmont soils are on high terraces. The Chagrin and Lobdell soils are on flood plains. The Poplimento, Webbtown, and Udults soils are similar in landscape position to Udalfs.

Because of the variability of this unit, a typical pedon is not given. Udalfs range from 20 to 60 inches or more thick. Depth to bedrock is highly variable over very short distances. Pebbles and cobblestones make up 0 to 40 percent of the A horizon and upper part of the Bt horizon. The lower part of the Bt horizon and the C horizon are 0 to 80 percent shale, siltstone, and sandstone fragments. Udalfs are very strongly acid or strongly acid in the A horizon and upper part of the Bt horizon and range from medium acid through mildly

alkaline in the lower part of the Bt horizon and in the C horizon.

The surface layer has hue of 2.5YR through 10YR, value of 4 through 6, and chroma of 3 through 8. The A horizon ranges from 4 to 20 inches thick and is silt loam, loam, silty clay loam, clay, or the gravelly or cobbly analogs of those textures. The underlying material has hue of 10R through 10YR, value of 4 through 6, and chroma of 4 through 8. Some pedons have low-chroma mottles. The underlying material ranges from 10 to 50 inches or more in thickness and is silty clay loam, clay, or the shaly or very shaly analogs of those textures. The substratum has colors similar to those of the surface layer. Some pedons have reddish brown or dusky red colors inherited from the residual shales. The substratum is silty clay loam, clay, or the shaly or very shaly analogs of those textures.

Udipsamments

Udipsamments consist of deep, variable soils that are excessively drained, well drained, and moderately well drained. They are on natural levees adjacent to streams in the Shenandoah Valley. Udipsamments formed in recently deposited alluvium derived from sandstone, shale, slate, metabasalt, and granite. Slope ranges from 0 to 8 percent.

Udipsamments are commonly near the Buckton, Chagrin, Lobdell, and Weaver soils. Udipsamments are sandier than the other soils.

Because of the variability of this map unit, a typical pedon is not given. The thickness of the alluvium or depth to bedrock is usually more than 6 feet. Pebbles and cobblestones of sandstone, greenstone, granite, and quartz make up 0 to 35 percent of the surface layer and upper part of the substratum and 0 to 70 percent of the lower part of the substratum. Udipsamments range from slightly acid through moderately alkaline.

The surface layer mainly has hue of 7.5YR through 2.5Y, value of 4 through 8, and chroma of 3 through 8. The surface layer ranges from 4 to 20 inches thick and is sand, loamy sand, or the gravelly analogs of those textures. The substratum has hue of 7.5YR through 5Y, value of 4 through 8, and chroma of 3 through 8. Some pedons have low-chroma mottles. The substratum has fine stratification, including cross-bedding, as a result of deposition of materials during flooding. It is stratified sand, loamy sand, or the gravelly analogs of those textures. Sandy loam and clay loam are in some pedons below a depth of 40 inches.

Udorthents

Udorthents in this survey area consist of deep, variable, well drained and moderately well drained soils in concave heads of drainageways at the base of steep, rocky slopes, and along intermittent drainageways that extend from near the crest of the Blue Ridge Mountains westward into the foothills. These soils are mostly heterogeneous colluvial deposits composed of stones and boulders mixed with cobblestones, pebbles, and soil materials derived from metabasalt, quartzite, sandstone, granite, and phyllite. Slope ranges from 0 to 45 percent.

Udorthents commonly are near the Catoctin, Dekalb, Fluvaquents, Lew, and Laidig soils. Udorthents have more rock fragments than the other soils.

Because of the variability of this unit, a typical pedon is not given. The thickness of the colluvial deposit or depth to bedrock is more than 60 inches. Stones and boulders make up 15 to 90 percent of the volume, and cobblestones and pebbles make up 15 to 80 percent. The soils range from very strongly acid through slightly acid.

The surface layer has hue of 7.5YR through 5Y, value of 2 through 8, and chroma of 1 through 8. It is 4 to 15 inches thick. Texture is variable and ranges from sandy loam, loam, silt loam, or clay loam to the very cobbly or very gravelly analogs of those textures. The subsurface layers and substratum have hue of 5YR through 5Y, value of 4 through 8, and chroma of 3 through 8. Some pedons have low-chroma mottles. Texture is variable and ranges from very cobbly to very gravelly or extremely cobbly to extremely gravelly analogs of sandy loam, loam, silt loam, or clay loam.

Udults

Udults consist of moderately deep and deep, well drained and moderately well drained soils on escarpments between flood plains and high terraces. These soils formed in a heterogeneous mixture of alluvium derived from sandstone, quartzite, shale, slate, and granite and in residuum weathered from shale, sandstone, quartzite, and limestone. The alluvium was deposited over the shale, sandstone, quartzite, and limestone, and subsequent downcutting of streams produced steep escarpments. These escarpments are a mixture of the residual and alluvial materials. Slope ranges from 15 to 45 percent.

Udults commonly are near the Braddock, Chagrin, Lobdell, Monongahela, Poplimento, Thurmont, Webbtown, and Udalfs soils. The Braddock, Monongahela, and Thurmont soils are on the higher terraces. The Chagrin and Lobdell soils are on flood plains. The Poplimento, Webbtown, and Udalfs soils are similar in landscape position to Udults.

Because of the variability of this unit, a typical pedon is not given. The thickness of the alluvium is more than 60 inches. Depth to bedrock is highly variable over short distances. Pebbles and cobblestones and shale fragments make up 0 to 60 percent of individual horizons. The soils are very strongly acid or strongly acid throughout.

The surface layer has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 2 through 8. The surface

layer ranges from 4 to 20 inches thick and is sandy loam, loam, silt loam, or the gravelly, very gravelly, cobbly, very cobbly, or stony analogs of those textures. The underlying material has hue of 10R through 2.5Y, value of 3 through 8, and chroma of 3 through 8. Some pedons have low-chroma mottles. The underlying material ranges from 10 to 50 inches thick and is sandy loam, loam, silty clay loam, clay loam, sandy clay, clay, or the gravelly, very gravelly, cobbly, or very cobbly analogs of those textures. Some pedons have a fragipan that is as much as 40 inches thick. The substratum has colors and textures similar to those of the subsurface layers. In some areas it contains a high percentage of shale and siltstone fragments derived from the residual bedrock.

Weaver series

The Weaver series consists of deep and moderately well drained soils on flood plains, usually below springs and along streams draining limestone areas in the Shenandoah Valley. These soils formed in calcareous alluvial sediments and massive deposits of travertine. Slope ranges from 0 to 3 percent.

The Weaver soils commonly are near the Buckton, Hollywood, McGary, Pagebrook, and Timberville soils. They are better drained than the Buckton soils, have more carbonate concretions than the Timberville soils, and have less clay than the Hollywood, McGary, or Pagebrook soils.

Typical pedon of Weaver silt loam, approximately 660 feet west-northwest of the junction of Spout Run and Virginia Highway 621, 30 feet south of Spout Run:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; moderate medium and fine granular structure; friable, sticky, plastic; many fine roots; many wormholes; 10 percent lime concretions; violent effervescence; moderately alkaline; clear smooth boundary.

B2—8 to 19 inches; brown (10YR 4/3) silt loam; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; many fine and medium roots; many wormholes; 5 percent gastropod and brachiopod shells and lime concretions; violent effervescence; moderately alkaline; clear smooth boundary.

C—19 to 24 inches; brown (10YR 4/3) silt loam; many medium faint grayish brown (10YR 5/2) mottles; massive; very friable; many fine and medium roots; common wormholes; 50 percent lime concretions and gastropod and brachiopod shells; violent effervescence; moderately alkaline; abrupt smooth boundary.

IIA1b—24 to 28 inches; very dark gray (10YR 3/1) loam; common medium distinct brown (10YR 4/3) mottles; weak medium and fine granular structure; friable; many fine and medium roots; many wormholes; common cracks about one-half inch wide; 5 percent lime concretions and gastropod and brachiopod shells; violent effervescence; moderately alkaline; clear smooth boundary.

IIB2gb—28 to 37 inches; dark gray (10YR 4/1) loam; many medium distinct brown (7.5YR 4/4) mottles; weak medium and coarse prismatic structure; friable; many fine and medium roots; many wormholes; common cracks about one-half inch wide; 5 percent lime concretions and gastropod and brachiopod shells; violent effervescence; moderately alkaline; gradual smooth boundary.

IIIA1b—37 to 44 inches; mottled dark gray (10YR 4/1), very dark gray (10YR 3/1), and very pale brown (10YR 8/3) loam; moderate medium and coarse granular structure; friable, slightly sticky, slightly plastic; many fine and medium roots; many wormholes; common cracks about one-half inch wide; 5 percent lime concretions and gastropod and brachiopod shells; violent effervescence; moderately alkaline; gradual smooth boundary.

IIIB2gb—44 to 54 inches; very dark gray (10YR 3/1) loam; common medium distinct very pale brown (10YR 8/3) mottles; weak medium and coarse prismatic structure; friable; many fine and medium roots; common wormholes; common cracks about one-half inch wide; 10 percent lime concretions and gastropod and brachiopod shells; violent effervescence; moderately alkaline; clear smooth boundary.

IIIC1—54 to 60 inches; mottled dark grayish brown (10YR 4/2), light brownish gray (10YR 6/2), and brown (7.5YR 5/2) silt loam; massive; very friable; many fine and medium roots; few wormholes; 40 percent lime concretions and brachiopod and gastropod shells; violent effervescence; moderately alkaline; gradual smooth boundary.

IIIC2—60 to 71 inches; brown (10YR 5/3) silt loam; massive; very friable; few wormholes; 50 percent lime concretions that contain leaf imprints and brachiopod and gastropod shells; violent effervescence; moderately alkaline.

The thickness of the solum and depth to bedrock range from 40 to 60 inches. Carbonate concretions, shells, and soft marly material make up 0 to 10 percent of the A horizon and B2 horizon and 5 to 50 percent of the underlying horizons. The soil ranges from neutral through moderately alkaline in the A and B horizons and is mildly alkaline or moderately alkaline in the C horizon and underlying buried horizons.

The A horizon has hue of 10YR, value of 4, and chroma of 2 through 4. It is silt loam or silty clay loam.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 through 6. It is silt loam or silty clay loam. The C horizon has hue of 10YR through 5Y, value of 4 or 5, and chroma of 2 through 6, or it is mottled with those colors. It is silt loam or silty clay loam. The buried A horizons have hue of 10YR, value of 2 through 4, and chroma of 1 through 3. They are silt loam or loam. The buried B horizons have hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 1 through 6. They are silt loam, silty clay loam, or loam.

Webbtown series

The Webbtown series consists of moderately deep and well drained soils on ridges and side slopes in the Shenandoah Valley. These soils formed in material weathered from a heterogeneous mixture of limestone, shale, siltstone, and calcareous sandstone (fig. 13). Slope ranges from 3 to 35 percent.

The Webbtown soils commonly are near the Duffield, Nicholson, Poplimento, and Timberville soils. The Webbtown soils contain more rock fragments than the other soils.

Typical pedon of Webbtown shaly silt loam, in an area of Poplimento-Webbtown complex, 3 to 8 percent slopes, approximately 0.3 mile west of Virginia Highway 608 and 1.3 miles south-southwest of the junction of Virginia Highways 7 and 608:

Ap—0 to 8 inches; brown (7.5YR 5/4) shaly silt loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine and medium roots; 20 percent shale and siltstone fragments; neutral; clear smooth boundary.

Figure 13.—Rock outcrop in an area of Webbtown-Poplimento-Rock outcrop complex, 15 to 30 percent slopes, eroded, shows alternating beds of light-colored limestone and dark-colored shale, siltstone, and sandstone.

B1—8 to 14 inches; brown (7.5YR 5/4) shaly silt loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; 40 percent shale and siltstone fragments; neutral; gradual smooth boundary.

B2—14 to 34 inches; strong brown (7.5YR 5/6) shaly silty clay loam; moderate medium subangular blocky structure; friable, sticky, plastic; few fine roots; pockets and lenses of silty clay with patchy clay films make up 25 percent of this horizon; common black coatings; 45 percent brownish yellow (10YR 6/6) soft shale and siltstone fragments; neutral; diffuse smooth boundary.

B3—34 to 50 inches; yellowish red (5YR 4/8) shaly silty clay; weak medium subangular blocky structure; friable, sticky, plastic; 45 percent brownish yellow (10YR 6/6) soft shale fragments; medium acid; clear smooth boundary.

C1—50 to 60 inches; strong brown (7.5YR 5/8) very shaly silt loam; massive; friable, sticky, plastic; 65 percent yellowish brown (10YR 5/6) and olive (5Y 5/4) soft shale and siltstone fragments; slightly acid; clear smooth boundary.

C2—60 to 72 inches; mixed yellowish red (5YR 5/6), strong brown (7.5YR 5/6), and brownish yellow (10YR 6/6) very shaly silty clay; massive; friable, sticky, plastic; 55 percent soft shale and siltstone fragments; slightly acid.

The thickness of the solum ranges from 30 to 60 inches. Depth to hard limestone, shale, siltstone, or sandstone bedrock is more than 30 inches. Rock fragments of shale or porous, very low density siltstone make up 15 to 35 percent of the A horizon, 35 to 75 percent of the B horizon, and 50 to 80 percent of the C horizon. The soil ranges from strongly acid through slightly acid in the A horizon and upper part of the B horizon and from medium acid through neutral in the lower part of the B horizon and in the C horizon.

The A horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 3 through 6. It is shaly silt loam or shaly silty clay loam. The B horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 4 through 8. It is shaly or very shaly analogs of silt loam, silty clay loam, silty clay, or clay. Clay textures are limited to the lower part of the B horizon. The C horizon has colors similar to those of the B horizon. Some pedons have reddish brown and dusky red colors inherited from the bedrock. Textures range from very shaly silt loam to very shaly clay.

Weikert series

The Weikert series consists of shallow and well drained soils on side slopes in the Shenandoah Valley. These soils formed in materials weathered from shale, siltstone, and sandstone. Slope ranges from 15 to 45 percent.

The Weikert soils commonly are near the Berks and Berks Variant soils. The Weikert soils are shallower than the other soils.

Typical pedon of Weikert shaly silt loam, in an area of Weikert-Berks shaly silt loams, 15 to 45 percent slopes, approximately 200 feet south of Virginia Highway 642 and 600 feet east of the junction of Wrights Run and Highway 642:

Ap—0 to 5 inches; dark yellowish brown (10YR 4/4) shaly silt loam; moderate fine granular structure; friable, slightly sticky; many fine roots; 45 percent shale fragments; medium acid; clear smooth boundary.

B2—5 to 12 inches; yellowish brown (10YR 5/4) very shaly silt loam; weak fine subangular blocky structure; friable, slightly sticky; common fine roots; 60 percent shale fragments; medium acid; clear wavy boundary.

C—12 to 15 inches; yellowish brown (10YR 5/4) very shaly silt loam; massive; friable, slightly sticky; few fine roots; 80 percent shale fragments; medium acid; clear wavy boundary.

R—15 inches; hard yellowish brown, gray, and brownish yellow shale tilted about 45 degrees.

The thickness of the solum ranges from 8 to 20 inches. Depth to bedrock ranges from 10 to 20 inches. Rock fragments of shale, siltstone, or fine-grained sandstone make up 20 to 50 percent of the A horizon, 30 to 65 percent of the B2 horizon, and 50 to 80 percent of the C horizon. The soil ranges from very strongly acid through medium acid unless limed.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is shaly silt loam or shaly loam. The B2 horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 3 through 6. It is shaly or very shaly analogs of silt loam or loam. The C horizon has colors similar to those of the B2 horizon. It is very shaly silt loam or very shaly loam. The bedrock is shale, siltstone, or fine-grained sandstone.

Whiteford series

The Whiteford series consists of deep and well drained soils on ridges in the foothills of the Blue Ridge Mountains. These soils formed in materials weathered mainly from slate and phyllite. Slope ranges from 3 to 8 percent.

The Whiteford soils commonly are near the Cardiff and Cataska soils. The Whiteford soils have fewer rock fragments than the other soils and also are deeper to hard rock than the Cataska soils.

Typical pedon of Whiteford silt loam, 3 to 8 percent slopes, approximately 1.4 miles south of Castleman's

Ferry Bridge and 0.8 mile east of the junction of Virginia Highways 607 and 606:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam; many medium faint yellowish brown (10YR 5/4) mottles; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; 10 percent slate fragments; neutral; abrupt smooth boundary.

B1t—5 to 10 inches; strong brown (7.5YR 5/6) silt loam; many medium distinct dark brown (10YR 4/3) mottles; weak medium and fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; common thin clay films on faces of peds; 5 percent slate fragments; slightly acid; gradual smooth boundary.

B2t—10 to 29 inches; yellowish red (5YR 4/8) silty clay loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; continuous medium clay films on faces of peds; 5 percent highly weathered slate fragments; strongly acid; gradual wavy boundary.

B3t—29 to 40 inches; mottled red (2.5YR 4/8), yellowish red (5YR 4/8), and brownish yellow (10YR 6/6) slaty clay loam; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; many medium clay films on faces of peds and coarse fragments; 25 percent highly weathered slate fragments; strongly acid; clear wavy boundary.

C—40 to 54 inches; brown (7.5YR 5/4) very slaty loam; massive; friable, slightly sticky, slightly plastic; 60 percent slate fragments; strongly acid; abrupt smooth boundary.

R—54 inches; tilted olive brown (2.5Y 4/4) hard slate that cannot be cut with an auger.

The thickness of the solum ranges from 20 to 40 inches. Depth to bedrock ranges from 40 to 60 inches. Fragments of slate make up 0 to 15 percent of the A horizon and upper part of the Bt horizon, 15 to 25 percent of the lower part of the Bt horizon, and 30 to 70 percent of the C horizon. The soil is very strongly acid or strongly acid unless limed.

The A horizon has hue of 5YR through 10YR, value of 3 through 5, and chroma of 2 through 4. Value of 3 is limited to an A1 horizon. The A horizon is silt loam or loam. The Bt horizon has hue of 2.5YR through 7.5YR, value of 4 or 5, and chroma of 4 through 8. It is silty clay loam, clay loam, or silt loam, and slaty analogs of these textures are in the lower part. The C horizon has hue of 10R through 7.5YR, value of 3 through 5, and chroma of 3 through 6. It is slaty or very slaty analogs of loam or silt loam.

Zoar series

The Zoar series consists of deep and moderately well drained soils on river terraces in the Shenandoah Valley. These soils formed in alluvial sediments derived mainly from crystalline rocks. Slope ranges from 3 to 8 percent.

The Zoar soils commonly are near the Braddock, Monongahela, and Thurmont soils. They are not as well drained as the Braddock or Thurmont soils and have more clay than the Monongahela soils.

Typical pedon of Zoar silt loam, in an area of Monongahela-Zoar complex, 3 to 8 percent slopes, approximately 0.8 mile west-southwest of Castleman's Ferry Bridge and 0.9 mile south of the junction of Virginia Highways 612 and 7:

Ap—0 to 7 inches; brown (7.5YR 5/4) silt loam; weak fine and medium granular structure; friable, slightly sticky, slightly plastic; many fine roots; 2 percent pebbles; slightly acid; abrupt smooth boundary.

B1t—7 to 12 inches; dark brown (7.5YR 4/4) loam; many medium faint yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; common thin clay films on faces of peds; 1 percent pebbles; strongly acid; clear smooth boundary.

B21t—12 to 23 inches; dark brown (7.5YR 4/4) clay; few medium faint light brown (7.5YR 6/4) mottles; moderate medium fine subangular blocky structure; friable, sticky, plastic; common fine roots; many medium clay films on faces of peds; 2 percent pebbles; very strongly acid; gradual smooth boundary.

B22t—23 to 41 inches; yellowish brown (10YR 5/4) clay; many medium distinct strong brown (7.5YR 5/6), pale brown (10YR 6/3), and gray (10YR 6/1) mottles; moderate medium and fine subangular blocky structure; friable, sticky, plastic; common fine roots; many medium clay films on faces of peds; 2 percent pebbles; very strongly acid; diffuse smooth boundary.

B23t—41 to 57 inches; mottled strong brown (7.5YR 5/6), light brownish gray (2.5Y 6/2), yellowish brown (10YR 5/4), and dark brown (7.5YR 4/4) clay; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; many medium clay films on faces of peds; 3 percent pebbles; very strongly acid; diffuse smooth boundary.

B24t—57 to 73 inches, mottled dark brown (7.5YR 4/4), gray (10YR 6/1), yellowish brown (10YR 5/4), and light yellowish brown (10YR 6/4) clay; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; many medium clay films on faces of peds; 3 percent pebbles; very strongly acid.

The thickness of the solum ranges from 40 to 80 inches. Depth to bedrock is more than 5 feet. Pebbles and cobblestones make up 0 to 3 percent of the solum. The soil is very strongly acid or strongly acid throughout unless limed.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 2 through 4. It is silt loam, loam, or silty clay loam. The B1 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. It is loam, clay loam, or silty clay loam. The B2t horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 4 through 8. It is clay, silty clay, or silty clay loam. Some pedons have a C horizon that has hue of 5YR through 10YR, value of 5 or 6, and chroma of 1 through 4 and is clay loam, silty clay loam, or clay.

formation of the soils

In this section the factors and processes that have affected the formation and morphology of the soils in Clarke County are discussed.

factors of soil formation

Soil is formed by weathering and other processes that act upon parent material. The characteristics of the soil at any given point depend upon interaction of parent material, climate, plants and animals, relief, and time.

Climate and plants and animals are the active forces of soil formation. They act on the parent material accumulated through the weathering of rocks and slowly change it into soil. Although all five factors affect the formation of every soil, the relative importance of each differs from place to place. In extreme cases one factor may dominate in the formation of a soil and fix most of its properties. In general, however, it is the combined action of the five factors that determines the character of each soil.

parent material

The unconsolidated mass from which a soil formed is parent material. It is largely responsible for the chemical and mineralogical composition of the soil and the rate at which soil-forming processes take place.

Parent materials in Clarke County are of three kinds: residual, alluvial, and colluvial. Some of the residual parent materials are limestone, shale, sandstone, and greenstone. Soils formed in residuum from limestone, dolomite, and shale are most extensive in the Shenandoah Valley and have a wide range of characteristics. Limestone-derived soils typically have a silty surface layer and a clayey subsoil. Examples are the Endcav and Swimley soils. Residuum from acid shale and siltstone is the parent material for the Weikert and Berks soils. The coarse textured acid sandstone residuum weathers to form the Dekalb soils. Greenstone-derived soils are confined to the Blue Ridge Mountains and include the Myersville soils.

Alluvial parent materials are of local origin along the smaller streams and of local and general origin along the major rivers. Soils derived from alluvium vary widely in texture and development. Examples are the Buckton, Braddock, Chagrin, Lobdell, and Monongahela soils.

Colluvial parent materials are dominantly along lower mountain slopes, and they are primarily moderately coarse textured or moderately fine textured. Examples are the Laidig and Lew soils.

climate

As a genetic factor, climate affects the physical, chemical, and biological relationships in soils, principally through the influence of precipitation and temperature. Water dissolves minerals, supports biological activity, and transports mineral and organic residue through the surface layer and subsoil. Temperature determines the types of physical, chemical, and biological activities that take place and the speed at which they act.

Because more water enters the soil as precipitation than is lost through evaporation and other processes, the humid climate of Clarke County has caused the soils to be leached. Many of the soluble materials that originally were present in the soil have been removed by this leaching. Exceptions are the alluvial soils which are recharged with carbonates by limestone springs and the soils that are shallow to calcareous rock. Precipitation is mainly responsible for the formation of the subsoil that characterizes most soils in the county. In addition to leaching out the soluble materials, water that percolates through the soil moves clay from the surface layer to a subsoil layer. Except for soils that formed in recent alluvium or sand or that have very steep slopes, the soils of Clarke County typically have more clay in the subsoil than in the surface layer.

Climate also influences the structure of the subsoil of well developed soils. The development of peds (aggregates) in the subsoil is caused partly by changes in volume of the soil mass that result from alternate wetting and drying.

plant and animal life

Micro-organisms, vegetation, animals, and man are major factors in the formation of soils. Vegetation is generally responsible for the color of the surface layer and the amount of organic matter and nutrients in the soil. Earthworms, cicadas, and burrowing animals help keep the soil open and porous. Micro-organisms decompose the vegetation and dead animal matter, thus releasing nutrients for plant food. Man has changed the soil by clearing trees and by mixing the soil layers.

Before settlement by man, native vegetation was the major living organism affecting soil development. The native vegetation consisted mainly of hardwoods. The

oaks, hickories, and chestnuts were the dominant trees in the original forest, and hemlock and white pine were the most abundant conifers in the cooler areas. Most hardwoods take a large amount of the available bases from the soil and constantly recycle them through leaf fall and decay. This has prevented the soils of Clarke County from becoming as leached as they would have been under a coniferous forest cover.

As farming developed in the county, man became an important factor in the development of the soils. The clearing of the forests, land cultivation, introduction of new plants, and changes in natural drainage all have their effect on soil development. The most important changes brought about by man are the mixing of the upper layers of the soil to form a plow layer; cultivating strongly sloping soils, which accelerates erosion; and liming and fertilizing to change the content of plant nutrients, especially in the upper layers of the soil.

relief

The relief of an area is determined mainly by its geologic formations and the rivers and streams that dissect it. Relief influences soil formation through its effects on moisture relationships, erosion, temperature, and plant cover.

The Shenandoah Valley west of the Norfolk and Western Railroad is a nearly level area underlain by Ordovician limestones and shales. This section has been slightly dissected by streams. The section east of the Norfolk and Western Railroad and west of the Shenandoah River is a rolling and hilly landscape underlain primarily by Cambrian limestones interbedded with siltstone, sandstone, and shale. Relief in this section increases from west to east as dissection by the Shenandoah River increases. The Blue Ridge Mountains, east of the Shenandoah River, are underlain by Cambrian and Precambrian rocks resistant to weathering, such as metabasalts, sandstones, phyllites, and quartzites. The maximum relief in the county is in the Blue Ridge Mountains.

The soils on most uplands are well drained. Soils on the terraces and flood plains range from well drained to poorly drained. Drainage is commonly related to the texture and position of the alluvium in which the soils formed. Thus, fine-textured slack-water deposits in low positions commonly are poorly drained, and deep deposits of coarser materials are well drained.

time

As a factor of soil formation, time generally is related to the degree of development, or horizon differentiation, within the soil. A soil that has little or no horizon development is considered a young soil, and one that has strongly developed horizons is considered an old, or mature, soil.

The oldest soils in Clarke County are those formed in residuum from carbonate rock. In general, these soils are in less sloping, relatively stable positions and formed in easily weatherable materials. These older soils have a strong degree of horizon differentiation. On very steep slopes, geologic erosion removed soil material in a relatively short period of time, and the soils generally have not been in place long enough to develop more than moderate horizon differentiation. Soils formed in recent alluvium have been in place only a relatively short time and show little or no development other than an accumulation of organic matter in the surface layer. They are generally stratified and have an irregular distribution of organic matter.

processes of soil formation

In Clarke County several processes are involved in the formation of soil horizons. Among these are the accumulation of organic matter, the leaching of soluble salts, the reduction and transfer of iron, the formation and translocation of clay minerals, and the layering of parent materials. These processes take place continually and generally at the same time throughout the profile. Such processes have been going on for thousands of years.

The accumulation of organic matter takes place with the decomposition of plant residue. In many places in Clarke County the layer of organic matter has been eroded away or has been mixed with materials from underlying layers through cultivation. The organic matter content of the surface layer varies from low in sandy soils, such as the Lakin soils, to moderate in medium textured flood-plain soils, such as the Buckton soils. A low or moderate content of organic matter is dominant for the soils in the county.

For soils to have a distinct subsoil, some of the lime and other soluble salts are probably leached before there is a translocation of clay minerals. Among the factors that affect this leaching are the kinds of salts originally present, the annual precipitation, and the texture of the soil profile. Except for the alluvial soils that are recharged with carbonates by limestone springs and the soils that are shallow to calcareous rock, most of the soils in the county are leached.

Gleying, or the process of chemical reduction and transfer of iron, occurs in soil when drainage is impeded. The naturally wet soils of Clarke County have some degree of gleying in one or more of their layers. The McGary and Zoar soils, for example, are gleyed because they have a high water table.

Where the soil is poorly aerated, iron that has been reduced, or deoxidized, generally becomes mobile and is removed from the soil. Part of the mobile iron moves within the layer where it originated or to another layer; part of it is segregated and reoxidized to form the red, yellowish red, strong brown, and yellowish brown mottles that indicate impeded drainage. The reduction,

segregation, and reoxidation of iron has occurred in the Monongahela soils.

When silicate clay forms from primary materials, some iron generally is freed as hydrated oxide. Depending on the degree of hydration, such oxides normally are reddish. In most well developed and freely aerated soils in Clarke County, hydrated iron oxide makes the subsoil red. An example is the clayey reddish subsoil of the Braddock soils.

The weathering of primary minerals to silicate clay minerals, largely by the process of hydrolysis, results finally in the production of kaolinitic clays. Kaolinite is regarded as the most common clay mineral in the soils of Clarke County. Other clays, such as montmorillonite, vermiculite, and mica, occur in smaller amounts. A few soils, such as Hollywood and Pagebrook soils, have more montmorillonite in the subsoil than other soils in the county.

Layering influences the formation of soil horizons in several ways. The formation of silicate clays varies directly with the amount of weatherable minerals in each layer. A layer high in slowly weatherable quartz sand forms less silicate clay than a layer high in easily weathered, silt-sized minerals. Water commonly moves more slowly between layers of different textures, and this results in a temporary excess of water in the upper layers. As the water slows, minerals carried down by percolation are deposited or are precipitated, commonly forming a compact layer or a clay layer that is slowly permeable or very slowly permeable.

If the compact layer is high in sand or silt and is brittle, it is called a fragipan. Genesis of the fragipan is not fully understood, but studies show that swelling and shrinking take place in vertical cracks during alternating wet and dry periods. This may account for the packing of soil particles and also for a gross polygonal pattern of cracks in the fragipan. Clay, silica, and oxides of aluminum are the most likely cementing agents causing brittleness and hardness. The Monongahela soil is an example of a Clarke County soil that has a well developed fragipan.

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glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves all or part of the crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—
Loose.—Noncoherent when dry or moist; does not hold together in a mass.
Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1952-78 at Berryville, Virginia]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	41.0	20.5	30.8	68	-9	39	2.47	1.25	3.52	6	9.0
February---	44.6	22.8	33.7	73	-2	39	2.21	1.05	3.21	5	7.6
March------	54.2	30.3	42.3	82	9	169	3.07	2.05	3.99	8	6.2
April------	66.3	39.7	53.0	90	21	390	3.30	1.92	4.53	8	.6
May--------	75.4	48.7	62.1	92	28	685	3.53	1.96	4.92	8	.0
June-------	83.0	57.2	70.1	96	39	903	3.94	1.99	5.62	7	.0
July-------	86.7	61.5	74.2	98	47	1,060	3.58	1.79	5.13	7	.0
August-----	85.5	60.6	73.1	97	44	1,026	3.96	2.03	5.63	7	.0
September--	78.8	53.4	66.2	97	33	786	3.08	1.55	4.41	5	.0
October----	67.6	41.4	54.5	86	22	450	3.03	1.37	4.47	5	.0
November---	55.6	32.9	44.2	79	12	153	2.84	1.28	4.16	6	1.9
December---	44.3	24.4	34.3	70	3	62	2.63	1.15	3.89	6	5.3
Yearly:											
Average--	65.3	41.1	53.2	---	---	---	---	---	---	---	---
Extreme--	---	---	---	100	-9	---	---	---	---	---	---
Total----	---	---	---	---	---	5,762	37.64	32.34	42.88	78	30.6

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1952-78
at Berryville, Virignia]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 4	May 12	May 30
2 years in 10 later than--	April 29	May 7	May 23
5 years in 10 later than--	April 19	April 26	May 9
First freezing temperature in fall:			
1 year in 10 earlier than--	October 12	October 4	September 21
2 years in 10 earlier than--	October 18	October 9	September 25
5 years in 10 earlier than--	October 29	October 19	October 4

TABLE 3.--GROWING SEASON

[Recorded in the period 1952-78 at Berryville Virginia]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	167	152	121
8 years in 10	176	160	130
5 years in 10	192	175	147
2 years in 10	208	190	164
1 year in 10	217	198	172

TABLE 4.--DISTRIBUTION OF SLOPE CLASSES AND ASPECT*

(For a 1 square mile area in each of eight units of the general soils map)

Area and slope class	Aspect (degrees)								
	45 Pct	90 Pct	135 Pct	180 Pct	225 Pct	270 Pct	315 Pct	360 Pct	TOTAL Pct
Berks-Endcav Weikert: near Carpers Valley									
A (0-3)	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.6
B (4-8)	2.2	3.9	4.7	5.3	1.7	2.5	3.9	7.2	31.3
C (9-15)	2.8	6.4	2.8	7.5	3.3	7.8	3.0	5.0	38.5
D (16-25)	1.7	5.8	0.3	6.4	0.8	4.2	0.8	7.2	27.1
E (26-45)	0.0	1.1	0.0	0.0	0.0	0.6	0.0	0.8	2.5
F (46-99)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	6.6	17.2	8.3	19.1	5.8	15.0	7.8	20.2	100.0

Area and slope class	Aspect (degrees)								
	45 Pct	90 Pct	135 Pct	180 Pct	225 Pct	270 Pct	315 Pct	360 Pct	TOTAL Pct
Carbo- Opequon-Oaklet: near Lost Corner									
A (0-3)	3.0	2.5	7.5	5.1	4.4	5.3	0.6	8.0	36.6
B (4-8)	1.4	12.2	10.2	25.5	2.5	3.6	0.3	7.8	63.4
C (9-15)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D (16-25)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E (26-45)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F (46-99)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.4	14.7	17.7	30.7	6.9	8.9	0.8	15.8	100.0

*See footnote at end of table.

TABLE 4.--DISTRIBUTION OF SLOPE CLASSES AND ASPECT*--Continued

Area and slope class	Aspect (degrees)								
	45 Pct	90 Pct	135 Pct	180 Pct	225 Pct	270 Pct	315 Pct	360 Pct	TOTAL Pct
Rock outcrop-Opequon-Swimley: near Crums Church									
A (0-3)	7.8	5.5	1.1	2.2	5.3	11.1	13.0	12.2	58.2
B (4-8)	0.8	4.4	2.5	1.7	0.6	13.9	6.4	11.1	41.3
C (9-15)	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.6
D (16-25)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E (26-45)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F (46-99)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	8.6	10.0	3.6	3.9	5.8	25.5	19.4	23.3	100.0

Area and slope class	Aspect (degrees)								
	45 Pct	90 Pct	135 Pct	180 Pct	225 Pct	270 Pct	315 Pct	360 Pct	TOTAL Pct
Poplimento-Timberville: near Sugar Hill									
A (0-3)	3.0	0.0	0.0	0.3	0.3	0.0	0.0	0.3	1.1
B (4-8)	1.4	8.9	10.5	15.8	6.4	12.7	6.1	8.6	70.4
C (9-15)	1.1	5.5	3.0	5.0	0.6	7.5	0.8	3.9	27.4
D (16-25)	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	1.1
E (26-45)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F (46-99)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2.8	14.4	13.6	22.2	7.2	20.2	6.9	12.7	100.0

*See footnote at end of table.

TABLE 4.--DISTRIBUTION OF SLOPE CLASSES AND ASPECT*--Continued

Area and slope class	Aspect (degrees)								
	45 Pct	90 Pct	135 Pct	180 Pct	225 Pct	270 Pct	315 Pct	360 Pct	TOTAL Pct
Poplimento-Webbtown-Timberville: near Lovers Leap									
A (0-3)	0.3	0.6	0.6	0.0	0.0	0.3	0.0	0.3	1.9
B (4-8)	1.4	5.3	2.8	8.9	3.0	4.7	4.7	6.4	37.1
C (9-15)	2.8	7.8	5.0	9.7	2.8	7.2	2.2	6.1	43.5
D (16-25)	0.6	3.6	0.3	3.6	0.8	4.4	0.3	3.6	17.2
E (26-45)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
F (46-99)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.0	17.2	8.6	22.2	6.6	16.6	7.2	16.6	100.0

Area and slope class	Aspect (degrees)								
	45 Pct	90 Pct	135 Pct	180 Pct	225 Pct	270 Pct	315 Pct	360 Pct	TOTAL Pct
Dekalb-Laidig: near Taylors Hill									
A (0-3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B (4-8)	1.4	0.3	0.0	2.2	3.0	1.1	2.5	1.1	11.6
C (9-15)	1.9	3.3	0.3	3.9	5.0	9.4	3.0	5.3	32.1
D (16-25)	0.8	4.4	1.7	3.6	4.7	4.2	3.3	7.5	30.2
E (26-45)	1.1	5.5	1.1	3.0	1.1	6.1	2.8	4.7	25.5
F (46-99)	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.6
TOTAL	5.3	14.1	3.0	12.7	13.9	20.8	11.6	18.6	100.0

*See footnote at end of table.

TABLE 4.--DISTRIBUTION OF SLOPE CLASSES AND ASPECT*--Continued

Area and slope class	Aspect (degrees)								
	45 Pct	90 Pct	135 Pct	180 Pct	225 Pct	270 Pct	315 Pct	360 Pct	TOTAL Pct
Cardiff-Cataska-Whiteford: near Spout Run									
A (0-3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B (4-8)	0.3	0.3	0.5	2.6	2.3	3.1	3.4	1.8	14.3
C (9-15)	0.8	2.9	3.1	6.5	6.0	8.3	8.1	6.0	41.7
D (16-25)	3.6	3.1	0.3	4.4	3.4	8.9	4.2	6.5	34.4
E (26-45)	0.0	0.3	0.0	2.3	0.3	3.1	0.3	3.4	9.6
F (46-99)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.7	6.5	3.9	15.9	12.0	23.4	15.9	17.7	100.0

Area and slope class	Aspect (degrees)								
	45 Pct	90 Pct	135 Pct	180 Pct	225 Pct	270 Pct	315 Pct	360 Pct	TOTAL Pct
Catoctin-Myersville-Lew: near Ashby Gap									
A (0-3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B (4-8)	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3	0.6
C (9-15)	0.6	0.3	1.4	2.8	2.2	1.9	8.0	5.8	23.0
D (16-25)	4.7	0.3	0.8	8.6	4.4	5.5	5.5	14.7	44.6
E (26-45)	1.4	0.0	0.3	2.8	4.2	6.6	3.9	8.9	28.0
F (46-99)	0.0	0.0	0.0	0.0	0.0	0.6	0.0	3.3	3.9
TOTAL	6.6	0.6	2.5	14.4	10.8	14.7	17.5	33.0	100.0

*Grender, G. C., W. J. Edmonds, and W. G. Harris SLASH - a computer program for relief, slope, aspect and topographic shapes in soil surveys. Unpublished report. Virginia Tech. Blacksburg, Virginia 24060.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1B	Berks-Berks Variant shaly silt loams, 3 to 8 percent slopes	1,117	1.0
1C	Berks-Berks Variant shaly silt loams, 8 to 15 percent slopes	416	0.4
2B	Braddock loam, 3 to 8 percent slopes	326	0.3
2C	Braddock loam, 8 to 15 percent slopes	191	0.2
3D	Braddock very stony loam, 15 to 45 percent slopes	207	0.2
4	Buckton soils	335	0.3
5B	Carbo-Opequon-Rock outcrop complex, 3 to 8 percent slopes	3,151	2.8
5C	Carbo-Opequon-Rock outcrop complex, 8 to 15 percent slopes	2,084	1.9
6B	Cardiff slaty loam, 3 to 8 percent slopes	848	0.8
6C	Cardiff slaty loam, 8 to 15 percent slopes	984	0.9
7D	Cataska-Cardiff slaty loams, 15 to 45 percent slopes	2,104	1.9
8D	Catoctin-Myersville complex, 15 to 45 percent slopes	160	0.1
9D	Catoctin-Myersville very stony silt loams, 15 to 45 percent slopes	2,984	2.7
10	Chagrin soils	1,057	0.9
11B	Clymer channery loam, 3 to 15 percent slopes	280	0.3
12D	Dekalb channery sandy loam, 15 to 30 percent slopes	436	0.4
12E	Dekalb channery sandy loam, 30 to 50 percent slopes	2,287	2.1
13D	Dekalb very stony sandy loam, 8 to 30 percent slopes	268	0.2
13E	Dekalb very stony sandy loam, 30 to 50 percent slopes	582	0.5
14C	Dekalb-Hazleton channery sandy loams, 3 to 15 percent slopes	662	0.6
15B	Endcav-Dandridge complex, 3 to 8 percent slopes	1,286	1.2
15C	Endcav-Dandridge complex, 8 to 15 percent slopes	268	0.2
16B	Fluvaquents, 0 to 8 percent slopes	840	0.8
17B	Hagerstown-Opequon-Rock outcrop complex, 3 to 15 percent slopes	4,842	4.2
18	Hollywood clay loam	445	0.4
19D	Laidig channery loam, 8 to 25 percent slopes	403	0.4
20D	Laidig very stony loam, 8 to 25 percent slopes	2,284	2.1
21B	Lakin loamy sand, 3 to 8 percent slopes	135	0.1
22C	Lew very stony silt loam, 8 to 15 percent slopes	1,516	1.4
22D	Lew very stony silt loam, 15 to 30 percent slopes	747	0.7
23	Lobdell soils	353	0.3
24	McGary silty clay loam	932	0.8
25B	Monongahela loam, 3 to 8 percent slopes	466	0.4
26B	Monongahela-Braddock complex, 3 to 8 percent slopes	1,391	1.2
26C	Monongahela-Braddock complex, 8 to 15 percent slopes	904	0.8
27B	Monongahela-Zoar complex, 3 to 8 percent slopes	414	0.4
28B	Myersville-Catoctin silt loams, 3 to 8 percent slopes	202	0.2
28C	Myersville-Catoctin silt loams, 8 to 15 percent slopes	283	0.3
29C	Myersville-Catoctin very stony silt loams, 8 to 15 percent slopes	1,720	1.5
30B	Nicholson-Duffield silt loams, 3 to 8 percent slopes	2,117	1.9
31B	Oaklet silt loam, 3 to 8 percent slopes	779	0.7
32B	Oaklet-Carbo complex, rocky, 3 to 8 percent slopes	2,956	2.7
33B	Pagebrook silty clay loam, 0 to 7 percent slopes	4,071	3.7
34	Pits, sand and gravel	69	0.1
35B	Poplimento silt loam, 3 to 8 percent slopes	4,645	4.2
35C	Poplimento silt loam, 8 to 15 percent slopes	869	0.8
36B	Poplimento silt loam, rocky, 3 to 8 percent slopes	3,004	2.7
36C	Poplimento silt loam, rocky, 8 to 15 percent slopes	1,144	1.0
37B	Poplimento-Rock outcrop complex, 3 to 15 percent slopes	4,173	3.7
38B	Poplimento-Webbtown complex, 3 to 8 percent slopes	4,250	3.8
38C	Poplimento-Webbtown complex, 8 to 15 percent slopes	925	0.8
38D2	Poplimento-Webbtown complex, 15 to 30 percent slopes, eroded	322	0.3
39B	Poplimento-Webbtown complex, rocky, 3 to 8 percent slopes	2,630	2.4
39C	Poplimento-Webbtown complex, rocky, 8 to 15 percent slopes	2,403	2.2
39D2	Poplimento-Webbtown complex, rocky, 15 to 35 percent slopes, eroded	1,049	0.9
40	Quarries-Dumps complex	46	*
41C	Rock outcrop-Catoctin complex, 3 to 45 percent slopes	168	0.2
42C	Rock outcrop-Dekalb complex, 3 to 45 percent slopes	1,269	1.1
43C	Rock outcrop-Opequon complex, 3 to 45 percent slopes	6,190	5.5
44B	Swimley silt loam, 3 to 8 percent slopes	528	0.5
45B	Swimley silt loam, rocky, 3 to 8 percent slopes	1,614	1.4
46B	Swimley-Hagerstown silt loams, 3 to 8 percent slopes	1,375	1.2
47B	Swimley-Hagerstown silt loams, rocky, 3 to 8 percent slopes	1,934	1.7
47C	Swimley-Hagerstown silt loams, rocky, 8 to 15 percent slopes	180	0.2
48B	Swimley-Rock outcrop complex, 3 to 8 percent slopes	1,364	1.2
49B	Thurmont loam, 3 to 8 percent slopes	190	0.2
50B	Thurmont gravelly loam, 3 to 8 percent slopes	265	0.2
51B	Timberville silt loam, 0 to 7 percent slopes	10,362	9.3
52B	Udipsamments, 0 to 8 percent slopes	971	0.9
53	Udorthents, loamy	98	0.1

See footnote at end of table.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
54C	Udorthents, extremely stony, 0 to 45 percent slopes	2,015	1.7
55D	Udults-Udalfs association, 15 to 45 percent slopes	604	0.5
56	Weaver silt loam	1,133	1.0
57C2	Webbtown-Poplimento-Rock outcrop complex, 3 to 15 percent slopes, eroded	1,438	1.3
57D2	Webbtown-Poplimento-Rock outcrop complex, 15 to 30 percent slopes, eroded	849	0.8
58D	Weikert-Berks shaly silt loams, 15 to 45 percent slopes	859	0.8
59B	Whiteford silt loam, 3 to 8 percent slopes	1,085	1.0
	Unsurveyed	656	0.6
	Water	851	0.8
	Total	111,360	100.0

* Less than 0.1 percent.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
1B---- Berks-Berks Variant	70	14	50	30	---	2.8	5.8
1C---- Berks-Berks Variant	65	13	45	25	---	2.4	5.0
2B---- Braddock	120	25	75	50	4.6	5.0	8.5
2C---- Braddock	115	23	70	45	4.3	4.5	8.0
3D---- Braddock	90	18	55	35	3.5	2.5	5.0
4---- Buckton	130	26	80	55	5.5	3.5	9.0
5B---- Carbo-Opequon-Rock outcrop	---	---	---	---	---	---	5.0
5C---- Carbo-Opequon-Rock outcrop	---	---	---	---	---	---	5.0
6B---- Cardiff	---	---	---	---	---	---	---
6C---- Cardiff	---	---	---	---	---	---	---
7D---- Cataska-Cardiff	---	---	---	---	---	---	---
8D---- Catoctin-Myersville	80	15	60	30	---	2.2	5.0
9D---- Catoctin-Myersville	---	---	---	---	---	---	5.0
10---- Chagrin	130	26	70	45	---	3.5	9.0
11B---- Clymer	110	22	70	40	4.0	3.0	8.0
12D---- Dekalb	70	14	50	30	---	2.0	5.6
12E, 13D, 13E---- Dekalb	---	---	---	---	---	---	5.0
14C---- Dekalb-Hazleton	93	18	62	38	---	2.9	6.6
15B---- Endcav-Dandridge	110	22	70	40	4.0	3.5	8.0
15C---- Endcav-Dandridge	105	20	65	35	3.5	3.0	7.5
16B**. Fluvaquents							

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
17B---- Hagerstown-Opequon-Rock outcrop	---	---	---	---	---	---	5.0
18---- Hollywood	65	12	45	25	---	2.5	5.6
19D---- Laidig	85	17	60	30	---	2.5	4.0
20D---- Laidig	---	---	---	---	---	---	5.0
21B---- Lakin	80	16	50	35	3.5	2.5	5.6
22C, 22D---- Lew	---	---	---	---	---	---	5.6
23---- Lobdell	130	26	80	5	---	3.5	9.0
24---- McGary	100	20	65	40	---	3.5	8.0
25B---- Monongahela	110	22	65	40	---	3.0	7.0
26B---- Monongahela-Braddock	110	22	65	40	3.5	3.0	7.0
26C---- Monongahela-Braddock	100	20	60	35	3.5	3.0	7.0
27B---- Monongahela-Zoar	105	21	65	40	---	3.0	7.0
28B---- Myersville-Catoctin	110	22	70	53	4.0	3.3	8.1
28C---- Myersville-Catoctin	100	20	65	48	3.5	3.1	7.8
29C---- Myersville-Catoctin	---	---	---	---	---	---	5.3
30B---- Nicholson-Duffield	130	25	65	45	5.0	3.5	7.7
31B---- Oaklet	115	22	65	45	4.0	3.0	7.5
32B---- Oaklet-Carbo	105	20	65	45	4.2	3.2	7.9
33B---- Pagebrook	75	14	60	45	4.0	3.5	7.0
34**. Pits							
35B---- Poplimento	130	26	75	45	4.5	3.5	8.5
35C---- Poplimento	115	25	70	40	4.3	3.0	8.0

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
36B---------- Poplimento	130	26	75	45	4.5	3.5	8.5
36C---------- Poplimento	115	25	70	40	4.3	3.0	8.0
37B---------- Poplimento-Rock outcrop	---	---	---	---	---	---	5.0
38B---------- Poplimento-Webbtown	110	22	70	40	4.0	3.3	7.0
38C---------- Poplimento-Webbtown	95	21	65	35	3.7	2.8	7.0
38D2---------- Poplimento-Webbtown	90	19	55	30	3.5	2.5	5.0
39B---------- Poplimento-Webbtown	110	22	70	40	4.0	3.3	7.0
39C---------- Poplimento-Webbtown	95	21	65	35	3.7	2.8	7.0
39D2---------- Poplimento-Webbtown	80	15	50	30	3.0	2.0	5.0
40---------- Quarries-Dumps	---	---	---	---	---	---	---
41C---------- Rock outcrop-Catoctin	---	---	---	---	---	---	---
42C---------- Rock outcrop-Dekalb	---	---	---	---	---	---	---
43C---------- Rock outcrop-Opequon	---	---	---	---	---	---	---
44B, 45B---------- Swimley	125	25	70	45	4.5	3.5	8.3
46B, 47B---------- Swimley-Hagerstown	130	26	75	45	4.9	3.5	8.4
47C---------- Swimley-Hagerstown	125	25	70	40	4.5	3.2	8.0
48B---------- Swimley-Rock outcrop	---	---	---	---	---	---	5.0
49B, 50B---------- Thurmont	125	25	75	45	4.6	4.5	8.4
51B---------- Timberville	120	22	65	55	5.0	3.5	7.5
52B**. Udipsamments							
53**, 54C**. Udorthents							
55D**: Udults.							
Udalfs.							

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
56---------- Weaver	115	22	65	45	---	3.5	7.5
57C2---------- Webbtown-Poplimento-Rock outcrop	---	---	---	---	---	---	5.0
57D2---------- Webbtown-Poplimento-Rock outcrop	---	---	---	---	---	---	5.0
58D---------- Weikert-Berks	---	---	---	---	---	---	3.0
59B---------- Whiteford	---	---	---	---	---	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
1B*, 1C*:								
Berks	3f	Slight	Slight	Moderate	Slight	Northern red oak	70	Eastern white pine, Virginia pine.
						Black oak	70	
						Virginia pine	70	
Berks Variant	3f	Slight	Slight	Moderate	Slight	Northern red oak	70	Yellow-poplar, eastern white pine.
						White ash	70	
						Sugar maple	70	
						Yellow-poplar	80	
2B, 2C	2c	Slight	Moderate	Slight	Slight	Northern red oak	80	Yellow-poplar, eastern white pine.
Braddock						Yellow-poplar	90	
						Eastern white pine	95	
						Virginia pine	76	
						Shortleaf pine	76	
3D	2r	Slight	Severe	Slight	Slight	Northern red oak	80	Yellow-poplar, eastern white pine.
Braddock						Yellow-poplar	90	
						Eastern white pine	95	
						Virginia pine	76	
						Shortleaf pine	76	
4*	2w	Slight	Moderate	Slight	Slight	Yellow-poplar	95	Eastern white pine, black walnut, yellow-poplar.
Buckton						Northern red oak	80	
						Eastern white pine	90	
5B*, 5C*:								
Carbo	3c	Slight	Moderate	Slight	Slight	Northern red oak	70	Eastern white pine, yellow-poplar, black walnut.
						Yellow-poplar	80	
						Eastern white pine	80	
Opequon	3c	Slight	Moderate	Severe	Moderate	Northern red oak	70	Eastern white pine.
						Yellow-poplar	80	
Rock outcrop.								
6B, 6C	3f	Slight	Slight	Moderate	Slight	Black oak	70	Eastern white pine.
Cardiff						Virginia pine	70	
						Eastern white pine	80	
						Shortleaf pine	70	
7D*:								
Cataska	5r	Moderate	Moderate	Severe	Moderate	Chestnut oak	50	Pitch pine, Virginia pine.
						Scarlet oak	50	
Cardiff	3r	Moderate	Moderate	Moderate	Slight	Black oak	70	Eastern white pine.
						Virginia pine	70	
						Eastern white pine	80	
						Shortleaf pine	70	
8D*, 9D*:								
Catoctin	4f	Moderate	Moderate	Moderate	Slight	Virginia pine	60	Virginia pine, eastern white pine.
						Shortleaf pine	60	
						Northern red oak	60	
						Yellow-poplar	70	
Myersville	1r	Moderate	Moderate	Slight	Slight	Northern red oak	86	Yellow-poplar, black walnut, eastern white pine.
						Yellow-poplar	96	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
10* Chagrin	1o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Sugar maple White oak Black cherry White ash Black walnut	86 96 86 --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, northern red oak, white oak.
11B Clymer	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine	77 90 90	Eastern white pine, yellow-poplar.
12D Dekalb (North aspect)	4f	Slight	Moderate	Moderate	Slight	Northern red oak	62	Eastern white pine, Virginia pine.
12D Dekalb (South aspect)	5f	Slight	Moderate	Severe	Slight	Northern red oak	53	Eastern white pine, Virginia pine.
12E Dekalb (North aspect)	4f	Moderate	Severe	Moderate	Slight	Northern red oak	62	Eastern white pine, Virginia pine.
12E Dekalb (South aspect)	5f	Moderate	Severe	Severe	Slight	Northern red oak	53	Eastern white pine, Virginia pine.
13D Dekalb (North aspect)	4f	Slight	Moderate	Moderate	Slight	Northern red oak	62	Eastern white pine, Virginia pine.
13D Dekalb (South aspect)	5f	Slight	Moderate	Severe	Slight	Northern red oak	53	Eastern white pine, Virginia pine.
13E Dekalb (North aspect)	4f	Moderate	Severe	Moderate	Slight	Northern red oak	62	Eastern white pine, Virginia pine.
13E Dekalb (South aspect)	5f	Moderate	Severe	Severe	Slight	Northern red oak	53	Eastern white pine, Virginia pine.
14C*: Dekalb	4f	Slight	Slight	Moderate	Slight	Northern red oak	57	Eastern white pine, Virginia pine.
Hazleton	3o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	70 80	Eastern white pine.
15B*: 15C*: Endcav	2c	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine	85 90 90	Yellow-poplar, eastern white pine, black walnut.
Dandridge	4d	Slight	Moderate	Severe	Moderate	White oak Virginia pine Eastern redcedar	60 55 40	Virginia pine, eastern redcedar.
17B*: Hagerstown	1c	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar	86 96	Black walnut, yellow-poplar, eastern white pine.
Opequon	3c	Slight	Moderate	Severe	Moderate	Northern red oak Yellow-poplar	70 80	Eastern white pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plar
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
Rock outcrop.								
18---------- Hollywood	2w	Slight	Severe	Severe	Slight	Yellow-poplar------- Sweetgum----------	100 90	Eastern white pin
19D, 20D---------- Laidig	3r	Slight	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- Eastern white pine-- Virginia pine-------	71 89 80 70	Eastern white pin yellow-poplar, black walnut.
21B---------- Lakin	4s	Slight	Moderate	Moderate	Slight	Northern red oak---- Virginia pine------- Chestnut oak-------- Black oak----------	60 60 60 60	Eastern white pine
22C---------- Lew	2o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Eastern white pine--	80 90 90	Virginia pine, yel poplar, eastern w pine.
22D---------- Lew	2r	Slight	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- Eastern white pine--	80 90 90	Virginia pine, yel poplar, eastern w pine.
23*---------- Lobdell	1o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Sugar maple--------- Black walnut-------- White oak---------- Black cherry-------- White ash----------	87 96 --- --- --- --- ---	Eastern white pine black walnut, yel poplar, northern red oak, white oak
24---------- McGary	3w	Slight	Moderate	Moderate	Moderate	White oak---------- Pin oak---------- Yellow-poplar------- Sweetgum----------	70 85 85 80	Eastern white pine, white, ash, yellow poplar, American sycamore.
25B---------- Monongahela	3o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Eastern white pine-- Virginia pine------- White ash---------- Black walnut--------	70 85 76 66 --- ---	Eastern white pine.
26B*, 26C*: Monongahela-------	3o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Eastern white pine-- Virginia pine------- White ash---------- Black walnut--------	70 85 76 66 --- ---	Eastern white pine.
Braddock---------- 	2c	Slight	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- Eastern white pine-- Virginia pine------- Shortleaf pine------	80 90 95 76 76	Yellow-poplar, easte white pine.
27B*: Monongahela-------	3o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Eastern white pine-- Virginia pine------- White ash---------- Black walnut--------	70 85 76 66 --- ---	Eastern white pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
27B*:								
Zoar	3w	Slight	Moderate	Slight	Slight	Northern red oak	70	Eastern white pine, shortleaf pine, yellow-poplar.
						Yellow-poplar	80	
						Virginia pine	70	
						Eastern white pine	80	
						Black oak	70	
						White oak	70	
						Red maple	---	
28B*, 28C*, 29C*:								
Myersville	1o	Slight	Slight	Slight	Slight	Northern red oak	86	Yellow-poplar, black walnut, eastern white pine.
						Yellow-poplar	96	
Catoctin	4f	Slight	Slight	Moderate	Slight	Virginia pine	60	Virginia pine, eastern white pine.
						Shortleaf pine	60	
						Yellow-poplar	70	
30B*:								
Nicholson	2o	Slight	Slight	Slight	Slight	Northern red oak	80	Black walnut, yellow-poplar, eastern white pine, shortleaf pine, white ash.
Duffield	1o	Slight	Slight	Slight	Slight	Northern red oak	86	Yellow-poplar, black walnut, eastern white pine.
						Yellow-poplar	96	
31B--Oaklet	2c	Slight	Moderate	Slight	Slight	Northern red oak	76	Eastern white pine, yellow-poplar, black walnut.
						Yellow-poplar	86	
32B*:								
Oaklet	2c	Slight	Moderate	Slight	Slight	Northern red oak	76	Eastern white pine, yellow-poplar, black walnut.
						Yellow-poplar	86	
Carbo	3c	Slight	Moderate	Slight	Slight	Northern red oak	70	Eastern white pine, yellow-poplar, black walnut.
						Yellow-poplar	80	
						Eastern white pine	80	
33B--Pagebrook	3c	Slight	Moderate	Moderate	Slight	Northern red oak	70	Eastern white pine, yellow-poplar, black walnut.
						Yellow-poplar	75	
35B, 35C, 36B, 36C--Poplimento	2c	Slight	Moderate	Slight	Slight	Northern red oak	80	Eastern white pine, yellow-poplar.
						Yellow-poplar	90	
37B*:								
Poplimento	2c	Slight	Moderate	Slight	Slight	Northern red oak	80	Eastern white pine, yellow-poplar.
						Yellow-poplar	90	
Rock outcrop.								

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
38B*, 38C*:								
Poplimento	2c	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar	80 90	Eastern white pine, yellow-poplar.
Webbtown	4f	Slight	Slight	Moderate	Slight	Virginia pine Shortleaf pine Northern red oak Yellow-poplar	60 60 60 70	Eastern white pine, black walnut, yellow-poplar.
38D2*:								
Poplimento	2r	Moderate	Severe	Slight	Slight	Northern red oak Yellow-poplar	80 90	Eastern white pine, yellow-poplar.
Webbtown	4f	Moderate	Moderate	Moderate	Slight	Virginia pine Shortleaf pine Northern red oak Yellow-poplar	60 60 60 70	Eastern white pine, black walnut, yellow-poplar.
39B*, 39C*:								
Poplimento	2c	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar	80 90	Eastern white pine, yellow-poplar.
Webbtown	4f	Slight	Slight	Moderate	Slight	Virginia pine Shortleaf pine Northern red oak Yellow-poplar	60 60 60 70	Eastern white pine, black walnut, yellow-poplar.
39D2*:								
Poplimento	2r	Moderate	Severe	Slight	Slight	Northern red oak Yellow-poplar	80 90	Eastern white pine, yellow-poplar.
Webbtown	4f	Moderate	Moderate	Moderate	Slight	Virginia pine Shortleaf pine Northern red oak Yellow-poplar	60 60 60 70	Eastern white pine, black walnut, yellow-poplar.
41C*:								
Rock outcrop.								
Catoctin	4r	Severe	Severe	Moderate	Slight	Virginia pine Shortleaf pine Northern red oak Yellow-poplar	60 60 60 70	Virginia pine, eastern white pine, black walnut.
42C*:								
Rock outcrop.								
Dekalb	4f	Slight	Slight	Moderate	Slight	Northern red oak	62	Eastern white pine, Virginia pine.
43C*:								
Rock outcrop.								
Opequon	3c	Severe	Severe	Severe	Moderate	Northern red oak Yellow-poplar	70 80	Virginia pine, eastern white pine.
44B, 45B	2c	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar	80 90	Eastern white pine, yellow-poplar.
Swimley								
46B*, 47B*, 47C*:								
Swimley	2c	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar	80 90	Eastern white pine, yellow-poplar.
Hagerstown	1c	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar	86 96	Yellow-poplar, eastern white pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
48B*:								
Swimley	2c	Slight	Moderate	Slight	Slight	Northern red oak	80	Eastern white pine, yellow-poplar.
						Yellow-poplar	90	
Rock outcrop.								
49B, 50B Thurmont	2o	Slight	Slight	Slight	Slight	Northern red oak	76	Eastern white pine, yellow-poplar.
						Yellow-poplar	88	
						Eastern white pine	88	
						Shortleaf pine	77	
51B Timberville	2o	Slight	Slight	Slight	Slight	Yellow-poplar	90	Yellow-poplar, black walnut, eastern white pine.
						Northern red oak	80	
						Shortleaf pine	80	
						Virginia pine	76	
56 Weaver	2w	Slight	Moderate	Slight	Slight	Yellow-poplar	100	Yellow-poplar, black walnut, eastern white pine.
						Northern red oak	80	
						Sweetgum	90	
						Eastern white pine	90	
						Black walnut	---	
57C2*:								
Webbtown	4f	Slight	Slight	Moderate	Slight	Virginia pine	60	Eastern white pine, black walnut, yellow-poplar.
						Shortleaf pine	60	
						Northern red oak	60	
						Yellow-poplar	70	
Poplimento	2c	Slight	Moderate	Slight	Slight	Northern red oak	80	Eastern white pine, yellow-poplar.
						Yellow-poplar	90	
Rock outcrop.								
57D2*:								
Webbtown	4f	Moderate	Moderate	Moderate	Slight	Virginia pine	60	Eastern white pine, black walnut, yellow-poplar.
						Shortleaf pine	60	
						Northern red oak	60	
						Yellow-poplar	70	
Poplimento	2r	Moderate	Severe	Slight	Slight	Northern red oak	80	Eastern white pine, yellow-poplar.
						Yellow-poplar	90	
Rock outcrop.								
58D*:								
Weikert	5d	Slight	Moderate	Severe	Moderate	Northern red oak	55	Virginia pine, shortleaf pine.
						Virginia pine	52	
Berks	4f	Slight	Moderate	Moderate	Slight	Northern red oak	60	Virginia pine, shortleaf pine.
						Virginia pine	60	
59B Whiteford	2o	Slight	Slight	Slight	Slight	Black oak	80	Eastern white pine, yellow-poplar.
						Yellow-poplar	90	
						Virginia pine	76	
						Shortleaf pine	76	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1B*:					
Berks	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Severe: small stones.
Berks Variant	Severe: small stones, wetness, percs slowly.	Severe: wetness, small stones, percs slowly.	Severe: small stones, wetness.	Severe: wetness.	Severe: small stones, wetness.
1C*:					
Berks	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: small stones, slope.	Slight	Severe: small stones.
Berks Variant	Severe: small stones, wetness, percs slowly.	Severe: wetness, small stones, percs slowly.	Severe: slope, small stones, wetness.	Severe: wetness.	Severe: small stones, wetness.
2B Braddock	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
2C Braddock	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
3D Braddock	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
4* Buckton	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
5B*:					
Carbo	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock.	Severe: erodes easily.	Moderate: thin layer.
Opequon	Severe: too clayey, depth to rock.	Severe: too clayey, depth to rock.	Severe: too clayey, depth to rock.	Severe: too clayey, erodes easily.	Severe: thin layer, too clayey.
Rock outcrop.					
5C*:					
Carbo	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
Opequon	Severe: too clayey, depth to rock.	Severe: too clayey, depth to rock.	Severe: slope, too clayey, depth to rock.	Severe: too clayey, erodes easily.	Severe: thin layer, too clayey.
Rock outcrop.					
6B Cardiff	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, large stones.
6C Cardiff	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones, slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
7D*:					
Cataska	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
Cardiff	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
8D*:					
Catoctin	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: large stones, slope.
Myersville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
9D*:					
Catoctin	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
Myersville	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
10* Chagrin	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
11B Clymer	Moderate: slope.	Moderate: slope.	Severe: slope, small stones.	Slight	Moderate: slope, large stones.
12D Dekalb	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, large stones.	Severe: slope, small stones.
12E Dekalb	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope, small stones.
13D Dekalb	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones, large stones.	Moderate: slope, large stones.	Severe: slope, small stones.
13E Dekalb	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones, large stones.	Severe: slope.	Severe: slope, small stones.
14C*:					
Dekalb	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: large stones.	Severe: small stones.
Hazleton	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: small stones, slope.	Slight	Moderate: slope, small stones.
15B*:					
Endcav	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
15B*: Dandridge	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight	Severe: small stones, thin layer.
15C*: Endcav	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Dandridge	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight	Severe: small stones, thin layer.
16B*. Fluvaquents					
17B*: Hagerstown	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
Opequon	Severe: too clayey, depth to rock.	Severe: too clayey, depth to rock.	Severe: slope, too clayey, depth to rock.	Severe: too clayey, erodes easily.	Severe: thin layer, too clayey.
Rock outcrop.					
18 Hollywood	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
19D Laidig	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
20D Laidig	Severe: slope.	Severe: slope.	Severe: slope, large stones, small stones.	Moderate: slope.	Severe: slope.
21B Lakin	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
22C Lew	Severe: small stones.	Severe: small stones.	Severe: large stones, slope, small stones.	Severe: large stones, small stones.	Severe: small stones, large stones.
22D Lew	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: large stones, small stones.	Severe: small stones, large stones, slope.
23* Lobdell	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight	Moderate: flooding.
24 McGary	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
25B Monongahela	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Severe: erodes easily.	Slight.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
26B*:					
Monongahela	Moderate: small stones, wetness.	Moderate: small stones, wetness.	Severe: small stones.	Severe: erodes easily.	Moderate: large stones.
Braddock	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
26C*:					
Monongahela	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Severe: erodes easily.	Moderate: slope, large stones.
Braddock	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: slope, small stones.
27B*:					
Monongahela	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Severe: erodes easily.	Slight.
Zoar	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
28B*:					
Myersville	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
Catoctin	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
28C*:					
Myersville	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Catoctin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
29C*:					
Myersville	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Slight	Moderate: large stones, slope.
Catoctin	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Slight	Moderate: large stones, droughty, slope.
30B*:					
Nicholson	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
Duffield	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
31B	Moderate:	Moderate:	Moderate:	Slight	Slight.
Oaklet	percs slowly.	percs slowly.	slope, percs slowly.		

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
32B*:					
Oaklet	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
Carbo	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock.	Severe: erodes easily.	Moderate: thin layer.
33B	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
34*.					
Pits					
35B	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Slight.
35C	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
36B	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Slight.
36C	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
37B*:					
Poplimento	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Rock outcrop.					
38B*:					
Poplimento	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Slight.
Webbtown	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, thin layer.
38C*:					
Poplimento	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Webbtown	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope, thin layer.
38D2*:					
Poplimento	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
38D2*:					
Webbtown	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
39B*:					
Poplimento	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Slight.
Webbtown	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, thin layer.
39C*:					
Poplimento	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Webbtown	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope, thin layer.
39D2*:					
Poplimento	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Webbtown	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
40*:					
Quarries.					
Dumps.					
41C*:					
Rock outcrop.					
Catoctin	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.	Severe: slope.	Severe: large stones, slope.
42C*:					
Rock outcrop.					
Dekalb	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones, large stones.	Moderate: slope, large stones.	Severe: slope, small stones.
43C*:					
Rock outcrop.					
Opequon	Severe: slope, too clayey, depth to rock.	Severe: slope, too clayey, depth to rock.	Severe: slope, too clayey, depth to rock.	Severe: too clayey, erodes easily.	Severe: slope, thin layer, too clayey.
44B, 45B Swimley	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
46B*, 47B*: Swimley	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Hagerstown	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
47C*: Swimley	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Hagerstown	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
48B*: Swimley	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Rock outcrop.					
49B Thurmont	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
50B Thurmont	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
51B Timberville	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
52B*. Udipsamments					
53*, 54C*. Udorthents					
55D*: Udults.					
Udalfs.					
56 Weaver	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: wetness, flooding.
57C2*: Webbtown	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope, thin layer.
Poplimento	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Rock outcrop.					
57D2*: Webbtown	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Poplimento	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Rock outcrop.					

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
58D*:					
Weikert	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, depth to rock, small stones.	Severe: slope.	Severe: slope, thin layer, small stones.
Berks	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.	Severe: slope, small stones.
59B Whiteford	Slight	Slight	Moderate: slope.	Slight	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1B*:										
Berks	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Very poor.
Berks Variant	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
1C*:										
Berks	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Berks Variant	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
2B Braddock	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
2C Braddock	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
3D Braddock	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
4* Buckton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
5B*:										
Carbo	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Opequon	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
5C*:										
Carbo	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Opequon	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
6B Cardiff	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
6C Cardiff	Fair	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
7D*:										
Cataska	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Cardiff	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
8D*:										
Catoctin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Myersville	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
9D*:										
Catoctin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Myersville	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
10* Chagrin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
11B Clymer	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
12D Dekalb	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
12E, 13D, 13E Dekalb	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
14C*:										
Dekalb	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Hazleton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
15B*:										
Endcav	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Dandridge	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.
15C*:										
Endcav	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Dandridge	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.
16B*. Fluvaquents										
17B*:										
Hagerstown	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Opequon	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
18 Hollywood	Fair	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
19D Laidig	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
20D Laidig	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
21B Lakin	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
22C, 22D Lew	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
23*. Lobdell										
24---------- McGary	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
25B---------- Monongahela	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
26B*:										
Monongahela-------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Braddock----------	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
26C*:										
Monongahela-------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Braddock----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
27B*:										
Monongahela-------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Zoar----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
28B*:										
Myersville--------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Catoctin----------	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
28C*:										
Myersville--------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Catoctin----------	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
29C*:										
Myersville--------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Catoctin----------	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
30B*:										
Nicholson---------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Duffield----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
31B---------- Oaklet	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
32B*:										
Oaklet----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
32B*: Carbo	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
33B---- Pagebrook	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
34*. Pits										
35B---- Poplimento	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
35C---- Poplimento	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
36B---- Poplimento	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
36C---- Poplimento	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
37B*: Poplimento----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Rock outcrop.										
38B*: Poplimento----	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Webbtown----	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
38C*: Poplimento----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Webbtown----	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
38D2*: Poplimento----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Webbtown----	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
39B*: Poplimento----	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Webbtown----	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
39C*: Poplimento----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Webbtown----	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
39D2*: Poplimento----	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
39D2*:										
Webbtown	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
40*:										
Quarries.										
Dumps.										
41C*:										
Rock outcrop.										
Catoctin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
42C*:										
Rock outcrop.										
Dekalb	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
43C*:										
Rock outcrop.										
Opequon	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
44B, 45B Swimley	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
46B*, 47B*:										
Swimley	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Hagerstown	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
47C*:										
Swimley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Hagerstown	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
48B*:										
Swimley	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Rock outcrop.										
49B, 50B Thurmont	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
51B Timberville	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
52B*. Udipsamments										
53*, 54C*. Udorthents										
55D*:										
Udults.										
Udalfs.										

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
56---------- Weaver	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
57C2*:										
Webbtown----------	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Poplimento--------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Rock outcrop.										
57D2*:										
Webbtown----------	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Poplimento--------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Rock outcrop.										
58D*:										
Weikert----------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Berks----------	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
59B---------- Whiteford	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1B*:						
Berks	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Slight	Severe: small stones.
Berks Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: small stones, wetness.
1C*:						
Berks	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.	Severe: small stones.
Berks Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, slope.	Severe: wetness.	Severe: small stones, wetness.
2B Braddock	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
2C Braddock	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
3D Braddock	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
4* Buckton	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
5B*:						
Carbo	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.
Opequon	Severe: depth to rock.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, low strength, shrink-swell.	Severe: thin layer, too clayey.
Rock outcrop.						
5C*:						
Carbo	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope, thin layer.
Opequon	Severe: depth to rock.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: slope, depth to rock, shrink-swell.	Severe: depth to rock, low strength, shrink-swell.	Severe: thin layer, too clayey.
Rock outcrop.						
6B Cardiff	Moderate: depth to rock, cutbanks cave.	Moderate: large stones.	Moderate: depth to rock, large stones.	Moderate: slope, large stones.	Moderate: frost action, large stones.	Moderate: small stones, large stones.
6C Cardiff	Moderate: depth to rock, cutbanks cave, slope.	Moderate: slope, large stones.	Moderate: depth to rock, slope, large stones.	Severe: slope.	Moderate: slope, frost action, large stones.	Moderate: small stones, large stones, slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
7D*:						
Cataska	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Cardiff	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
8D*:						
Catoctin	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
Myersville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
9D*:						
Catoctin	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Myersville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
10*---------- Chagrin	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
11B---------- Clymer	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, large stones.
12D, 12E, 13D, 13E---------- Dekalb	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
14C*:						
Dekalb	Severe: depth to rock.	Moderate: slope, depth to rock, large stones.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock, large stones.	Severe: small stones.
Hazleton	Moderate: depth to rock, slope, large stones.	Moderate: slope, large stones.	Moderate: slope, large stones, depth to rock.	Severe: slope.	Moderate: slope, frost action, large stones.	Moderate: slope, small stones.
15B*:						
Endcav	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Dandridge	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: small stones, thin layers.
15C*:						
Endcav	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
Dandridge	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: small stones, thin layer.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
16B*. Fluvaquents						
17B*: Hagerstown	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: large stones, slope.
Opequon	Severe: depth to rock.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: slope, depth to rock, shrink-swell.	Severe: depth to rock, low strength, shrink-swell.	Severe: thin layer, too clayey.
Rock outcrop.						
18--- Hollywood	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
19D, 20D--- Laidig	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
21B--- Lakin	Severe: cutbanks cave.	Slight---	Slight---	Moderate: slope.	Slight---	Moderate: droughty.
22C--- Lew	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.	Severe: small stones, large stones.
22D--- Lew	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: small stones, large stones, slope.
23*--- Lobdell	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
24--- McGary	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
25B--- Monongahela	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: low strength, wetness.	Slight.
26B*: Monongahela	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: low strength, wetness.	Moderate: large stones.
Braddock	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Moderate: large stones.
26C*: Monongahela	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: slope, low strength, wetness.	Moderate: slope, large stones.
Braddock	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope, large stones.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
27B*:						
Monongahela	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: low strength, wetness.	Slight.
Zoar	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Slight.
28B*:						
Myersville	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
Catoctin	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.	Moderate: droughty.
28C*:						
Myersville	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Catoctin	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock.	Moderate: droughty, slope.
29C*:						
Myersville	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: large stones, slope.
Catoctin	Severe: depth to rock.	Moderate: slope, depth to rock, large stones.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, large stones.	Moderate: large stones, droughty, slope.
30B*:						
Nicholson	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: low strength.	Moderate: wetness.
Duffield	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
31B Oaklet	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
32B*:						
Oaklet	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Carbo	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.
33B Pagebrook	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, shrink-swell.	Severe: flooding.
34*. Pits						
35B Poplimento	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
35C---------- Poplimento	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
36B---------- Poplimento	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
36C---------- Poplimento	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
37B*: Poplimento-------	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
Rock outcrop.						
38B*: Poplimento-------	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Webbtown---------	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action.	Moderate: small stones, thin layer.
38C*: Poplimento-------	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
Webbtown---------	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.	Moderate: small stones, slope, thin layer.
38D2*: Poplimento-------	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Webbtown---------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
39B*: Poplimento-------	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Webbtown---------	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action.	Moderate: small stones, thin layer.
39C*: Poplimento-------	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
39C*:						
Webbtown	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.	Moderate: small stones, slope, thin layer.
39D2*:						
Poplimento	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Webbtown	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
40*:						
Quarries.						
Dumps.						
41C*:						
Rock outcrop.						
Catoctin	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
42C*:						
Rock outcrop.						
Dekalb	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
43C*:						
Rock outcrop.						
Opequon	Severe: slope, depth to rock.	Severe: slope, depth to rock, shrink-swell.	Severe: slope, depth to rock, shrink-swell.	Severe: slope, depth to rock, shrink-swell.	Severe: slope, depth to rock, low strength.	Severe: slope, thin layer, too clayey.
44B, 45B Swimley	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
46B*, 47B*:						
Swimley	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Hagerstown	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: large stones.
47C*:						
Swimley	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Hagerstown	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: large stones, slope.
48B*:						
Swimley	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
48B*: Rock outcrop.						
49B---- Thurmont	Moderate: wetness.	Slight----	Moderate: wetness.	Moderate: slope.	Moderate: frost action.	Slight.
50B---- Thurmont	Moderate: wetness.	Slight----	Moderate: wetness.	Moderate: slope.	Moderate: frost action.	Moderate: small stones
51B---- Timberville	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
52B*. Udipsamments						
53*, 54C*. Udorthents						
55D*: Udults.						
Udalfs.						
56---- Weaver	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: wetness, flooding.
57C2*: Webbtown----	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.	Moderate: small stones, slope, thin layer.
Poplimento----	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
Rock outcrop.						
57D2*: Webbtown----	Severe. depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Poplimento----	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Rock outcrop.						
58D*: Weikert----	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, thin layer, small stones.
Berks----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
59B---- Whiteford	Moderate: depth to rock.	Slight----	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1B*:					
Berks	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: small stones, area reclaim.
Berks Variant	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Poor: area reclaim, seepage, small stones.
1C*:					
Berks	Severe: depth to rock.	Severe: slope, seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: small stones, area reclaim.
Berks Variant	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Poor: area reclaim, seepage, small stones.
2B Braddock	Moderate: percs slowly.	Severe: seepage.	Severe: seepage, too clayey.	Slight	Poor: too clayey, hard to pack.
2C Braddock	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
3D Braddock	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, small stones.
4* Buckton	Severe: flooding.	Severe: seepage, flooding.	Severe: seepage, flooding.	Severe: flooding.	Fair: too clayey, thin layer.
5B*:					
Carbo	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Opequon	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Rock outcrop.					
5C*:					
Carbo	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Opequon	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
5C*: Rock outcrop.					
6B---- Cardiff	Moderate: depth to rock, percs slowly.	Severe: seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: small stones.
6C---- Cardiff	Moderate: depth to rock, percs slowly, slope.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: small stones.
7D*: Cataska----	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
Cardiff----	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
8D*, 9D*: Catoctin----	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
Myersville----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
10*---- Chagrin	Severe: flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Good.
11B---- Clymer	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Poor: small stones.
12D, 12E---- Dekalb	Severe: slope, depth to rock, poor filter.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, area reclaim.
13D, 13E---- Dekalb	Severe: slope, depth to rock, poor filter.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, area reclaim.
14C*: Dekalb----	Severe: depth to rock, poor filter.	Severe: slope, depth to rock, seepage.	Severe: seepage, depth to rock.	Severe: seepage, depth to rock.	Poor: small stones, area reclaim.
Hazleton----	Severe: poor filter.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: small stones.
15B*: Endcav----	Severe: percs slowly.	Moderate: slope, depth to rock.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
15B*: Dandridge	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, small stones.
15C*: Endcav	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Dandridge	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, small stones.
16B*. Fluvaquents					
17B*: Hagerstown	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Opequon	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Rock outcrop.					
18--- Hollywood	Severe: percs slowly.	Moderate: depth to rock.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
19D, 20D--- Laidig	Severe: slope, percs slowly, wetness.	Severe: seepage, slope, wetness.	Severe: slope.	Severe: slope, seepage.	Poor: slope.
21B--- Lakin	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
22C--- Lew	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.	Severe: seepage.	Poor: hard to pack, large stones.
22D--- Lew	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: seepage, slope.	Poor: hard to pack, large stones, slope.
23*--- Lobdell	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
24--- McGary	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
25B--- Monongahela	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Fair: small stones, wetness.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
26B*:					
Monongahela	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Fair: small stones, wetness.
Braddock	Moderate: percs slowly.	Severe: seepage.	Severe: seepage, too clayey.	Slight	Poor: too clayey, hard to pack, small stones.
26C*:					
Monongahela	Severe: percs slowly, wetness.	Severe: slope, wetness.	Moderate: slope, wetness.	Moderate: slope.	Fair: small stones, wetness, slope.
Braddock	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack, small stones.
27B*:					
Monongahela	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Fair: small stones, wetness.
Zoar	Severe: percs slowly, wetness.	Severe: wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
28B*:					
Myersville	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
Catoctin	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: area reclaim, small stones.
28C*:					
Myersville	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
Catoctin	Severe: depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: area reclaim, small stones.
29C*:					
Myersville	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey, large stones.	Moderate: slope.	Fair: too clayey, small stones, slope.
Catoctin	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones.
30B*:					
Nicholson	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
30B*: Duffield	Moderate: depth to rock.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: hard to pack.
31B Oaklet	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
32B*: Oaklet	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Carbo	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
33B Pagebrook	Severe: flooding, wetness, percs slowly.	Moderate: slope.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, small stones.
34*. Pits					
35B Poplimento	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey.
35C Poplimento	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey.
36B Poplimento	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey.
36C Poplimento	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey.
37B*: Poplimento	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey.
Rock outcrop.					
38B*: Poplimento	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey.
Webbtown	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, small stones.
38C*: Poplimento	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey.
Webbtown	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, small stones.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
38D2*:					
Poplimento	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, slope.
Webbtown	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, slope.
39B*:					
Poplimento	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey.
Webbtown	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, small stones.
39C*:					
Poplimento	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey.
Webbtown	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, small stones.
39D2*:					
Poplimento	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, slope.
Webbtown	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, slope.
40*:					
Quarries.					
Dumps.					
41C*:					
Rock outcrop.					
Catoctin	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
42C*:					
Rock outcrop.					
Dekalb	Severe: slope, depth to rock, poor filter.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, area reclaim.
43C*:					
Rock outcrop.					
Opequon	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
44B, 45B---------- Swimley	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
46B*, 47B*: Swimley----------	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
Hagerstown---------	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
47C*: Swimley----------	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Hagerstown---------	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
48B*: Swimley----------	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
Rock outcrop.					
49B---------- Thurmont	Moderate: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Good.
50B---------- Thurmont	Moderate: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Poor: small stones.
51B---------- Timberville	Severe: flooding.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack, small stones.
52B*. Udipsamments					
53*, 54C*. Udorthents					
55D*: Udults.					
Udalfs.					
56---------- Weaver	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, depth to rock, wetness.	Severe: flooding, wetness.	Fair: area reclaim, too clayey.
57C2*: Webbtown----------	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, small stones.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
57C2*:					
Poplimento	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey.
Rock outcrop.					
57D2*:					
Webbtown	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, slope.
Poplimento	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, slope.
Rock outcrop.					
58D*:					
Weikert	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, area reclaim, seepage.
Berks	Severe: depth to rock, slope.	Severe: slope, seepage, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: seepage, slope, depth to rock.	Poor: small stones, slope, area reclaim.
59B Whiteford	Moderate: depth to rock, percs slowly.	Moderate: seepage, slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: area reclaim, too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1B*, 1C*:				
Berks	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Berks Variant	Poor: area reclaim, wetness.	Improbable: small stones.	Improbable: thin layer.	Poor: small stones, wetness.
2B, 2C	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
Braddock				
3D	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Braddock				
4*	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim.
Buckton				
5B*, 5C*:				
Carbo	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, large stones.
Opequon	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, small stones.
Rock outcrop.				
6B, 6C	Fair: area reclaim, thin layer.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, area reclaim.
Cardiff				
7D*:				
Cataska	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Cardiff	Poor: slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, area reclaim, slope.
8D*, 9D*:				
Catoctin	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Myersville	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
10*	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Chagrin				
11B	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Clymer				

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
12D---------- Dekalb	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
12E---------- Dekalb	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
13D---------- Dekalb	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
13E---------- Dekalb	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
14C*:				
Dekalb----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Hazleton----------	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
15B*:				
Endcav----------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Dandridge----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
15C*:				
Endcav----------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Dandridge----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
16B*. Fluvaquents				
17B*:				
Hagerstown----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Opequon----------	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, small stones.
Rock outcrop.				
18---------- Hollywood	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
19D, 20D---------- Laidig	Fair: slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
21B---------- Lakin	Good----------	Probable----------	Improbable: excess fines.	Fair: too sandy.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
22C---------- Lew	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim.
22D---------- Lew	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
23*---------- Lobdell	Fair: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
24---------- McGary	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
25B---------- Monongahela	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
26B*, 26C*: Monongahela----------	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Braddock----------	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
27B*: Monongahela----------	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Zoar----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, too clayey.
28B*: Myersville----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Catoctin----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
28C*: Myersville----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Catoctin----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
29C*: Myersville----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Catoctin----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
30B*: Nicholson----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
30B*: Duffield	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
31B---- Oaklet	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
32B*: Oaklet	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Carbo	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, large stones.
33B---- Pagebrook	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
34*. Pits				
35B, 35C, 36B, 36C---- Poplimento	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
37B*: Poplimento	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Rock outcrop.				
38B*, 38C*: Poplimento	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Webbtown	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
38D2*: Poplimento	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Webbtown	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
39B*, 39C*: Poplimento	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Webbtown	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
39D2*:				
Poplimento	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Webbtown	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
40*:				
Quarries.				
Dumps.				
41C*:				
Rock outcrop.				
Catoctin	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
42C*:				
Rock outcrop.				
Dekalb	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
43C*:				
Rock outcrop.				
Opequon	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, small stones.
44B, 45B Swimley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
46B*, 47B*, 47C*:				
Swimley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
Hagerstown	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
48B*:				
Swimley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
Rock outcrop.				
49B Thurmont	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
50B Thurmont	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
51B Timberville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
52B*. Udipsamments				
53*, 54C*. Udorthents				
55D*: Udults.				
Udalfs.				
56---------- Weaver	Fair: area reclaim, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
57C2*: Webbtown----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Poplimento----------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Rock outcrop.				
57D2*: Webbtown----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Poplimento----------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Rock outcrop.				
58D*: Weikert----------	Poor: slope, area reclaim.	Improbable: small stones.	Improbable: thin layer.	Poor: slope, small stones, area reclaim.
Berks----------	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
59B---------- Whiteford	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
1B*:						
Berks	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Depth to rock, large stones.	Droughty, depth to rock, large stones.
Berks Variant	Moderate: depth to rock, slope.	Severe: seepage, wetness.	Severe: no water.	Percs slowly, depth to rock, large stones.	Large stones, depth to rock, wetness.	Large stones, wetness, depth to rock.
1C*:						
Berks	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
Berks Variant	Severe: slope.	Severe: seepage, wetness.	Severe: no water.	Percs slowly, depth to rock, large stones.	Slope, large stones, depth to rock.	Large stones, wetness, slope.
2B--- Braddock	Moderate: seepage, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Favorable	Favorable.
2C--- Braddock	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
3D--- Braddock	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, large stones.	Large stones, slope.
4*--- Buckton	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
5B*:						
Carbo	Moderate: depth to rock, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Depth to rock, erodes easily, percs slowly.	Erodes easily, depth to rock, percs slowly.
Opequon	Severe: depth to rock.	Severe: hard to pack, thin layer.	Severe: no water.	Deep to water	Depth to rock, erodes easily.	Erodes easily, depth to rock, droughty.
Rock outcrop.						
5C*:						
Carbo	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Opequon	Severe: depth to rock, slope.	Severe: hard to pack, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop.						
6B--- Cardiff	Severe: seepage.	Severe: large stones.	Severe: no water.	Deep to water	Large stones	Large stones.
6C--- Cardiff	Severe: seepage, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones.	Large stones, slope.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
7D*:						
Cataska	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Cardiff	Severe: seepage, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones.	Large stones, slope.
8D*:						
Catoctin	Severe: seepage, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Myersville	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
9D*:						
Catoctin	Severe: seepage, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Myersville	Severe: slope.	Moderate: thin layer, piping, large stones.	Severe: no water.	Deep to water	Slope, large stones.	Large stones, slope.
10* Chagrin	Moderate: seepage.	Severe: piping.	Severe: cutbanks cave.	Deep to water	Favorable	Favorable.
11B Clymer	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, large stones.	Large stones, slope.
12D, 12E Dekalb	Severe: seepage, slope.	Severe: piping, large stones.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, droughty.
13D, 13E Dekalb	Severe: seepage, slope.	Severe: piping, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, large stones.	Slope, large stones, droughty.
14C*:						
Dekalb	Severe: seepage, slope.	Severe: piping, large stones.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, droughty.
Hazleton	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, too sandy.	Large stones, slope, droughty.
15B*:						
Endcav	Moderate: depth to rock, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Dandridge	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Large stones, depth to rock.	Large stones, droughty, depth to rock.
15C*:						
Endcav	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Dandridge	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
16B*. Fluvaquents						
17B*: Hagerstown	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
Opequon	Severe: depth to rock, slope.	Severe: hard to pack, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop.						
18--- Hollywood	Moderate: depth to rock.	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
19D--- Laidig	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope, rooting depth.
20D--- Laidig	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, large stones, rooting depth.	Slope, large stones, droughty.
21B--- Lakin	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy	Droughty.
22C, 22D--- Lew	Severe: slope.	Severe: piping, hard to pack, large stones.	Severe: no water.	Deep to water	Slope, large stones.	Large stones, slope.
23*--- Lobdell	Severe: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Flooding, frost action.	Erodes easily, wetness.	Erodes easily.
24--- McGary	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.
25B--- Monongahela	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.
26B*: Monongahela	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.
Braddock	Moderate: seepage, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Large stones	Large stones.
26C*: Monongahela	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Braddock	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, large stones.	Large stones, slope.
27B*: Monongahela	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.
Zoar	Moderate: slope.	Severe: hard to pack, thin layer.	Severe: no water.	Slope, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
28B*:						
Myersville	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Favorable	Favorable.
Catoctin	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Large stones, depth to rock.	Large stones, droughty, depth to rock.
28C*:						
Myersville	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Catoctin	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
29C*:						
Myersville	Severe: slope.	Moderate: thin layer, piping, large stones.	Severe: no water.	Deep to water	Slope, large stones.	Large stones, slope.
Catoctin	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
30B*:						
Nicholson	Slight	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
Duffield	Moderate: seepage, depth to rock, slope.	Severe: piping, hard to pack.	Severe: no water.	Deep to water	Favorable	Favorable.
31B---- Oaklet	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
32B*:						
Oaklet	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Carbo	Moderate: depth to rock, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Depth to rock, erodes easily, percs slowly.	Erodes easily, depth to rock, percs slowly.
33B---- Pagebrook	Moderate: slope.	Severe: hard to pack.	Severe: slow refill.	Percs slowly, flooding, slope.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
34*. Pits						
35B---- Poplimento	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Favorable	Favorable.
35C---- Poplimento	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
36B---- Poplimento	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Favorable	Favorable.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
36C---------- Poplimento	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope----------	Slope.
37B*: Poplimento-------	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope----------	Slope.
Rock outcrop.						
38B*: Poplimento-------	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Favorable------	Favorable.
Webbtown---------	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock	Depth to rock.
38C*, 38D2*: Poplimento-------	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope----------	Slope.
Webbtown---------	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
39B*: Poplimento-------	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Favorable------	Favorable.
Webbtown---------	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock	Depth to rock.
39C*, 39D2*: Poplimento-------	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope----------	Slope.
Webbtown---------	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
40*: Quarries.						
Dumps.						
41C*: Rock outcrop.						
Catoctin---------	Severe: seepage, slope.	Severe: large stones.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
42C*: Rock outcrop.						
Dekalb----------	Severe: seepage, slope.	Severe: piping, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, large stones.	Slope, large stones, droughty.
43C*: Rock outcrop.						
Opequon----------	Severe: depth to rock, slope.	Severe: hard to pack, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
44B, 45B---------- Swimley	Moderate: seepage, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
46B*, 47B*: Swimley----------	Moderate: seepage, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Hagerstown-------	Moderate: seepage, depth to rock, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Favorable------	Favorable.
47C*: Swimley----------	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Hagerstown-------	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope----------	Slope.
48B*: Swimley----------	Moderate: seepage, slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Rock outcrop.						
49B---------- Thurmont	Moderate: seepage, slope.	Moderate: thin layer, piping.	Moderate: deep to water, slow refill.	Deep to water	Favorable------	Favorable.
50B---------- Thurmont	Moderate: seepage, slope.	Moderate: thin layer, piping, large stones.	Moderate: deep to water, slow refill.	Deep to water.	Large stones.	Large stones.
51B---------- Timberville	Moderate: seepage, slope.	Moderate: piping, hard to pack.	Severe: no water.	Deep to water	Favorable------	Favorable.
52B*. Udipsamments						
53*, 54C*. Udorthents						
55D*: Udults.						
Udalfs.						
56---------- Weaver	Moderate: seepage, depth to rock.	Severe: piping, wetness.	Moderate: slow refill, depth to rock.	Flooding-------	Wetness--------	Favorable.
57C2*, 57D2*: Webbtown----------	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
Poplimento-------	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope----------	Slope.
Rock outcrop.						

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
58D*:						
Weikert	Severe: depth to rock, slope, seepage.	Severe: seepage, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, droughty.
Berks	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
59B Whiteford	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1B*, 1C*:											
Berks	0-7	Shaly silt loam	GM, ML, GC, SC	A-2, A-4	0-20	50-80	45-70	40-60	30-55	25-36	5-10
	7-25	Shaly loam, very shaly loam, shaly silt loam.	GM, GC, SM, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	25-34	Very shaly loam, very shaly silt loam.	GM, SM	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
Berks Variant	0-8	Shaly silt loam	GM, GC, ML, SC	A-2, A-4	0-30	40-80	35-75	30-70	20-65	25-36	5-10
	8-24	Shaly silt loam, shaly loam, very shaly silt loam.	SM, GM, GC	A-2, A-4	0-30	20-65	15-60	10-50	8-45	25-36	5-10
	24-32	Very shaly silt loam, very shaly loam.	GM, GC	A-2	0-40	15-40	10-35	8-30	5-25	25-36	5-10
	32	Weathered bedrock	---	---	---	---	---	---	---	---	---
2B, 2C	0-11	Loam	CL, SM, ML, SC	A-2, A-4	0-5	85-100	75-95	50-85	25-65	<30	NP-10
Braddock	11-42	Clay loam, gravelly sandy clay, clay.	MH, CH, CL, SC	A-7, A-2	0-5	70-95	70-90	45-90	20-80	42-60	15-28
	42-74	Loam, cobbly clay loam, cobbly clay.	SC, CL,	A-2, A-4, A-6, A-7	0-50	75-95	60-90	55-85	30-70	25-50	8-28
3D	0-8	Very stony loam	CL, SM, SC, ML	A-2, A-4	5-20	85-100	75-95	50-85	25-65	<30	NP-10
Braddock	8-33	Clay loam, cobbly clay loam, clay.	MH, CH, CL, SC	A-7, A-2	0-30	60-95	50-90	40-90	35-80	42-60	15-28
	33-74	Loam, cobbly clay loam, cobbly clay.	SC, CL,	A-2, A-4, A-6, A-7	0-50	75-95	60-90	55-85	30-70	25-50	8-28
4*	0-7	Silty clay loam	CL, CL	A-6, A-7	0-2	99-100	98-100	80-100	60-95	25-45	10-20
Buckton	7-48	Silt loam, silty clay loam, clay loam.		A-4, A-6, A-7	0-2	99-100	98-100	90-95	70-90	20-45	7-25
	48-77	Sand, gravelly sandy loam, cobbly loam.	SM, SM-SC, CL-ML	A-1, A-2, A-4	0-25	75-90	70-90	45-65	15-55	<20	NP-7
5B*, 5C*:											
Carbo	0-7	Silty clay loam	CL	A-6, A-7	0-2	95-100	90-100	85-95	75-85	30-50	10-15
	7-37	Clay	CH	A-7	0-5	95-100	85-100	80-95	70-90	60-80	35-55
	37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Opequon	0-8	Silty clay	CL, MH, CH	A-6, A-7	0-5	85-100	80-100	80-100	75-95	30-55	10-30
	8-17	Clay, silty clay.	CH, MH, CL	A-6, A-7	0-10	80-100	60-100	60-100	55-95	35-65	15-40
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			10	40	200		
	In				Pct					Pct	
6B----------	0-7	Slaty loam-------	ML	A-4	10-20	70-85	60-80	55-70	50-65	<30	NP-8
Cardiff	7-35	Slaty silt loam, slaty loam.	GM, SM	A-2, A-4, A-6	30-50	60-70	35-60	30-55	25-50	34-40	10-12
	35-46	Very slaty silt loam, very slaty loam.	GM, GP-GM	A-1, A-2, A-4	60-80	15-50	10-40	10-40	10-40	<30	NP
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
6C----------	0-6	Slaty loam-------	ML	A-4	10-20	70-85	60-80	55-70	50-65	<30	NP-8
Cardiff	6-32	Slaty silt loam, slaty loam.	GM, SM	A-2, A-4, A-6	30-50	60-70	35-60	30-55	25-50	34-40	10-12
	32-42	Very slaty silt loam, very slaty loam.	GM, GP-GM	A-1, A-2, A-4	60-80	15-50	10-40	10-40	10-40	<30	NP
	42	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
7D*:											
Cataska---------	0-3	Slaty loam	CL-ML, ML, GM, GM-GC	A-4	5-15	55-80	50-75	45-70	40-60	<30	NP-6
	3-13	Slaty loam, very slaty silt loam, very slaty loam.	GM-GC, GM, GP-GM	A-2, A-1	10-25	15-50	10-45	10-40	10-35	<30	NP-7
	13-21	Weathered bedrock	---	---	---	---	---	---	---	---	---
	21	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Cardiff---------	0-6	Slaty loam-------	ML	A-4	10-20	70-85	60-80	55-70	50-65	<30	NP-8
	6-32	Slaty silt loam, slaty loam.	GM, SM	A-2, A-4, A-6	30-50	60-70	35-60	30-55	25-50	34-40	10-12
	32-42	Very slaty silt loam, very silty loam.	GM, GP-GM	A-1, A-2, A-4	60-80	15-50	10-40	10-40	10-40	<30	NP
	42	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
8D*:											
Catoctin--------	0-6	Cobbly silt loam	ML, GC, GM, CL	A-2, A-4	20-50	50-70	45-65	40-60	35-55	<30	NP-8
	6-20	Channery silt loam, channery silty clay loam, cobbly silty clay loam.	SM, SC, CL, GM	A-2, A-4, A-6	0-25	50-80	35-75	30-60	25-60	20-34	2-12
	20-29	Very channery silt loam, channery silt loam.	SM, SC, GC, GM	A-2, A-4, A-1, A-3	10-40	30-75	10-60	9-55	7-50	<28	NP-8
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---
*Myersville------	0-7	Channery silt loam.	ML, CL, SM	A-4, A-2	0-5	65-85	50-75	40-65	30-60	18-28	2-10
	7-38	Silty clay loam, clay loam, channery clay loam.	CL	A-6	0-3	70-95	60-95	55-90	50-85	28-38	12-20
	38-62	Silt loam, channery silt loam, very channery clay loam.	CL, CL-ML, GM	A-3, A-4	0-3	25-90	20-85	12-75	10-60	<28	NP-10

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
9D*:											
Catoctin--------	0-6	Very stony silt loam.	ML, CL, CL-ML	A-4	5-20	80-90	75-85	70-80	60-70	<30	NP-8
	6-20	Channery silt loam, channery silty clay loam, cobbly silty clay loam.	SM, SC, CL, GM	A-2, A-4, A-6	0-25	50-80	35-75	30-60	25-60	20-34	2-12
	20-29	Very channery silt loam, channery silt loam.	SM, SC, GC, GM	A-2, A-4, A-1, A-3	10-40	30-75	10-60	9-55	7-50	<28	NP-8
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---
Myersville------	0-7	Very stony silt loam.	ML, CL, CL-ML	A-4	5-25	95-100	90-100	80-95	55-85	18-28	2-10
	7-38	Silty clay loam, clay loam, channery clay loam.	CL	A-6	3-20	75-95	70-95	55-90	50-85	28-38	12-20
	38-62	Silty clay loam, channery silt loam, very channery clay loam.	CL, CL-ML, GM	A-3, A-4	3-20	30-85	20-75	12-70	10-65	<28	NP-10
10*-------------- Chagrin	0-9	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	95-100	85-100	55-85	35-55	<25	NP-5
	9-42	Silt loam, loam, sandy loam.	ML, SM	A-4, A-2, A-6	0	90-100	75-100	55-90	30-80	20-40	NP-14
	42-72	Stratified silt loam to fine sand.	ML, SM	A-4, A-2	0	85-100	75-100	50-85	15-80	20-40	NP-10
11B-------------- Clymer	0-10	Channery loam----	ML, SM, GM	A-2, A-4	0-15	60-80	50-70	45-65	30-60	10-30	NP-9
	10-30	Sandy loam, channery loam, channery clay loam.	GM, SM, GC, ML	A-2, A-4	0-20	60-95	50-95	45-85	30-60	14-32	NP-9
	30-62	Channery loam, very channery loam, channery sandy loam.	GM, GP-GM, GC, SM	A-1, A-2, A-3, A-4	10-30	30-75	25-70	20-60	5-40	14-32	NP-9
12D, 12E--------- Dekalb	0-8	Channery sandy loam.	SM, GM, ML, CL-ML	A-2, A-4, A-1	0-30	50-90	45-80	40-75	20-55	10-32	NP-9
	8-31	Channery sandy loam, channery loam, very channery sandy loam.	SM, GM, ML, GM-GC	A-2, A-4, A-1	5-40	50-85	40-80	40-75	20-55	15-32	NP-9
	31-39	Channery sandy loam, flaggy sandy loam, very flaggy loamy sand.	SM, GM, SC, GC	A-2, A-4, A-1	10-50	45-85	25-75	20-65	15-40	15-32	NP-9
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
13D, 13E--------- Dekalb	0-8	Very stony sandy loam.	SM, GM, ML, CL-ML	A-2, A-4, A-1	10-30	50-90	45-80	40-75	20-55	10-32	NP-9
	8-31	Channery sandy loam, channery loam, very channery sandy loam.	SM, GM, ML, GM-GC	A-2, A-4, A-1	5-40	50-85	40-75	40-75	20-55	15-32	NP-9
	31-39	Channery sandy loam, flaggy sandy loam, very flaggy loamy sand.	SM, GM, SC, GC	A-2, A-4, A-1	10-50	45-85	25-75	20-65	15-40	15-32	NP-9
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
14C*: Dekalb----------	0-8	Channery sandy loam.	SM, GM, ML, CL-ML	A-2, A-4, A-1	0-30	50-90	45-80	40-75	20-55	10-32	NP-9
	8-31	Channery sandy loam, channery loam, very channery sandy loam.	SM, GM, ML, GM-GC	A-2, A-4, A-1	5-40	50-85	40-80	40-75	20-55	15-32	NP-9
	31-39	Channery sandy loam, flaggy sandy loam, very flaggy loamy sand.	SM, GM, SC, GC	A-2, A-4, A-1	10-50	45-85	25-75	20-65	15-40	15-32	NP-9
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hazleton---------	0-8	Channery sandy loam.	ML, GM, SM	A-2, A-4	0-15	60-85	60-80	60-75	35-55	<30	NP-8
	8-29	Channery sandy loam, loam, very channery loam.	GM, SM, ML, SC	A-2, A-4, A-1	0-50	60-95	45-90	35-70	20-55	<30	NP-8
	29-55	Channery loam, very channery sandy loam, very channery loamy sand.	GM, SM, SC, GC	A-2, A-1, A-4	0-60	55-80	35-75	25-65	15-50	<30	NP-8
15B*, 15C*: Endcav----------	0-18	Silty clay loam	CL	A-6, A-7	0	90-100	90-100	85-100	75-95	30-50	10-25
	18-42	Clay, silty clay.	CH	A-7	0	80-100	75-100	70-100	60-95	60-85	35-55
	42-64	Shaly silty clay, very shaly silty clay.	GC	A-6, A-7	15-20	25-50	25-50	15-45	15-40	35-60	25-35
	64	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Dandridge--------	0-5	Shaly silty clay loam.	CL, GC, SC	A-6, A-4	5-15	35-90	35-80	35-75	35-70	25-40	8-20
	5-17	Shaly silty clay loam, shaly silty clay, shaly clay loam.	GC	A-7, A-6	15-20	25-50	25-50	15-45	15-40	35-60	15-35
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
16B*. Fluvaquents											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
17B*:											
Hagerstown------	0-6	Silt loam--------	CL, CL-ML	A-4, A-6, A-7	0-15	85-100	80-100	80-100	70-95	25-50	5-25
	6-52	Clay, silty clay, silty clay loam.	CH, CL	A-7, A-6	0-5	85-100	80-100	75-100	75-95	30-65	15-40
	52	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Opequon----------	0-8	Silty clay-------	CL, MH, CH	A-6, A-7	0-5	85-100	80-100	80-100	75-95	30-55	10-30
	8-17	Clay, silty clay.	CH, MH, CL	A-6, A-7	0-10	80-100	60-100	60-100	55-95	35-65	15-40
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
18---------------	0-12	Clay loam--------	CL	A-6, A-7	0	98-100	98-100	95-100	75-95	25-45	11-25
Hollywood	12-72	Silty clay, clay	CH	A-7	0	98-100	98-100	95-100	75-95	51-75	25-45
19D---------------	0-14	Channery loam----	GM, SM, ML, CL	A-4	0-5	65-90	55-80	50-80	35-70	15-30	1-10
Laidig											
	14-32	Channery loam, channery sandy clay loam, channery sandy loam.	SM, SC, CL, ML	A-2, A-4, A-6	5-20	70-95	55-90	40-80	20-70	15-40	2-18
	32-60	Channery sandy clay loam, channery loam, channery sandy loam.	GC, SC, GM-GC, CL-ML	A-2, A-4, A-6	5-20	50-90	40-85	30-80	15-70	15-35	2-16
20D---------------	0-14	Very stony loam	GM-GC, SM, CL-ML, SM-SC	A-4	3-15	65-90	50-80	45-80	35-70	15-30	NP-10
Laidig											
	14-32	Channery loam, channery sandy clay loam, channery sandy loam.	SM, SC, ML, CL	A-2, A-4, A-6	5-20	70-95	55-90	40-80	20-70	15-40	2-18
	32-60	Channery sandy clay loam, channery loam, channery sandy loam.	SC, GM-GC, CL-ML, GC	A-2, A-4, A-6	5-20	50-90	40-85	30-80	15-70	15-35	2-16
21B---------------	0-10	Loamy sand-------	SM, SM-SC	A-2	0	95-100	95-100	95-100	10-35	<30	NP-7
Lakin	10-50	Loamy sand, fine sand, loamy sand	SM, SM-SC, SP-SM	A-2, A-3	0	95-100	95-100	90-100	5-35	<30	NP-7
	50-70	Sand, sandy loam, gravelly sand.	SM, SM-SC, GM, SP-SM	A-1, A-2, A-3	0	40-100	35-100	20-80	5-25	<30	NP-7
22C---------------	0-7	Very stony silt loam.	ML, GM, CL, GC	A-2, A-4	5-70	35-85	30-75	28-70	25-60	<28	NP-8
Lew											
	7-63	Channery silty clay loam, very channery silty clay loam, channery clay loam.	ML, MH, GM, SM	A-2, A-4, A-6, A-7	15-70	40-90	30-75	28-75	25-70	32-56	8-20

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
22D---------- Lew	0-6	Very stony silt loam.	ML, GM, CL, GC	A-2, A-4	5-70	35-85	30-75	28-70	25-60	<28	NP-8
	6-63	Channery silty clay loam, very channery silty clay loam, channery clay loam.	ML, MH, GM, SM	A-2, A-4, A-6, A-7	15-70	40-90	30-75	28-75	25-70	32-56	8-20
23*---------- Lobdell	0-9	Loam----------	ML, CL-ML, CL	A-4	0	95-100	90-100	80-100	65-90	20-30	NP-8
	9-26	Loam, silt loam	ML	A-4	0	90-100	80-100	70-95	55-85	20-35	NP-10
	26-64	Stratified sandy loam to silt loam.	ML, SM, CL-ML	A-4	0	90-100	80-100	65-85	40-80	15-35	NP-10
24---------- McGary	0-9	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	15-25
	9-60	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-100	45-60	25-35
25B---------- Monongahela	0-9	Loam----------	ML, SM, CL-ML, SM-SC	A-4	0-5	90-100	85-100	75-100	45-90	20-35	1-10
	9-21	Silt loam, clay loam, gravelly loam.	ML, CL, CL-ML	A-4, A-6	0-15	90-100	80-100	75-100	70-90	20-40	5-15
	21-60	Silt loam, sandy clay loam, gravelly loam.	ML, CL, SM, SC	A-4, A-6	0-10	80-100	60-100	55-95	45-95	20-40	3-15
26B*: Monongahela-----	0-9	Cobbly loam------	ML, SM, CL-ML, SM-SC	A-4	10-20	85-95	80-90	70-80	45-75	20-35	1-10
	9-21	Silt loam, clay loam, gravelly loam.	ML, CL, CL-ML	A-4, A-6	0-15	90-100	80-100	75-100	70-90	20-40	5-15
	21-60	Silt loam, sandy clay loam, gravelly loam.	ML, CL, SM, SC	A-4, A-6	0-10	80-100	60-100	55-95	45-95	20-40	3-15
Braddock--------	0-11	Gravelly loam----	SM, SC, GM, GC	A-1, A-2	5-30	60-85	50-75	30-60	15-35	<30	NP-10
	11-41	Clay loam, gravelly sandy clay, cobbly clay.	MH, CH, CL, SC	A-7, A-2	0-30	60-95	50-90	40-90	35-80	42-60	15-28
	41-74	Loam, very gravelly sandy clay loam, gravelly clay.	SC, CL	A-2, A-4, A-6, A-7	0-75	75-95	60-90	55-85	30-70	25-50	8-28
26C*: Monongahela-----	0-7	Cobbly loam------	ML, SM, CL-ML, SM-SC	A-4	10-20	85-95	80-90	70-80	45-75	20-35	1-10
	7-18	Silt loam, clay loam, gravelly loam.	ML, CL, CL-ML	A-4, A-6	0-15	90-100	80-100	75-100	70-90	20-40	5-15
	18-60	Silt loam, sandy clay loam, gravelly loam.	ML, CL, SM, SC	A-4, A-6	0-10	80-100	60-100	55-95	45-95	20-40	3-15

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
26C*:											
Braddock	0-8	Gravelly loam	SM, SC, GM, GC	A-1, A-2	5-30	60-85	50-75	30-60	15-35	<30	NP-10
	8-41	Clay loam, gravelly sandy clay, cobbly clay.	MH, CH, CL, SC	A-7, A-2	0-30	60-95	50-90	40-90	35-80	42-60	15-28
	41-74	Loam, very gravelly sandy clay loam, gravelly clay.	SC, CL	A-2, A-4, A-6, A-7	0-75	75-95	60-90	55-85	30-70	25-50	8-28
27B*:											
Monongahela	0-9	Loam	ML, SM, CL-ML, SM-SC	A-4	0-5	90-100	85-100	75-100	45-90	20-35	1-10
	9-21	Silt loam, clay loam, gravelly loam.	ML, CL, CL-ML	A-4, A-6	0-15	90-100	80-100	75-100	45-90	20-35	1-10
	21-60	Silt loam, sandy clay loam, gravelly loam.	ML, CL, SM, SC	A-4, A-6	0-10	80-100	60-100	55-95	45-95	20-40	3-15
Zoar	0-12	Silt loam	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	75-95	20-40	3-15
	12-73	Clay loam, silty clay loam, clay.	CL, CH, ML, MH	A-6, A-7	0	95-100	95-100	90-100	75-95	30-60	11-35
28B*:											
Myersville	0-10	Silt loam	ML, CL, CL-ML	A-4	0-3	95-100	95-100	80-95	55-85	18-28	2-10
	10-35	Silty clay loam, clay loam, channery clay loam.	CL	A-6	0-3	70-95	60-95	55-90	50-85	28-38	12-20
	35-62	Silt loam, channery silt loam, very channery clay loam.	CL, CL-ML, GM	A-3, A-4	0-3	25-90	20-85	12-75	10-60	<28	NP-10
Catoctin	0-8	Silt loam	ML, CL, CL-ML	A-4	0-5	80-95	80-90	60-85	50-80	<30	NP-8
	8-24	Channery silt loam, channery silty clay loam.	SM, SC, CL, GM	A-2, A-4, A-6	0-25	50-80	35-75	30-60	25-60	20-34	2-12
	24-32	Very channery silt loam, channery silt loam.	SM, GM, GC, SC	A-2, A-4, A-1, A-3	10-40	30-75	10-60	9-55	7-50	<28	NP-8
	32	Weathered bedrock	---	---	---	---	---	---	---	---	---
28C*:											
Myersville	0-8	Silt loam	ML, CL, CL-ML	A-4	0-3	95-100	95-100	80-95	55-85	18-28	2-10
	8-40	Silty clay loam, clay loam, channery clay loam.	CL	A-6	0-3	70-95	60-95	55-90	50-85	28-38	12-20
	40-62	Silt loam, channery silt loam, very channery clay loam.	CL, CL-ML, GM	A-3, A-4	0-3	25-90	20-85	12-75	10-60	<28	NP-10

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
28C*:											
Catoctin	0-6	Silt loam	ML, CL, CL-ML	A-4	0-5	80-95	80-90	60-85	50-80	<30	NP-8
	6-24	Channery silt loam, channery silty clay loam.	SM, SC, CL, GM	A-2, A-4, A-6	0-25	50-80	35-75	30-60	25-60	20-34	2-12
	24-28	Very channery silt loam, channery silt loam.	SM, GM, GC, SC	A-2, A-4, A-1, A-3	10-40	30-75	10-60	9-55	7-50	<28	NP-8
	28	Weathered bedrock	---	---	---	---	---	---	---	---	---
29C*:											
Myersville	0-8	Very stony silt loam.	ML, CL, CL-ML	A-4	5-25	95-100	90-100	80-95	55-85	18-28	2-10
	8-40	Silty clay loam, clay loam, channery clay loam.	CL	A-6	3-20	75-95	70-95	55-90	50-85	28-38	12-20
	40-62	Silty clay loam, channery silt loam, very channery clay loam.	CL, CL-ML, GM	A-3, A-4	3-20	30-85	20-75	12-70	10-65	<28	NP-10
Catoctin	0-6	Very stony silt loam.	ML, CL, CL-ML	A-4	5-20	80-90	75-85	70-80	60-70	<30	NP-8
	6-24	Channery silt loam, channery silty clay loam, cobbly silty clay loam.	SM, SC, CL, GM	A-2, A-4, A-6	0-25	50-80	35-75	30-60	25-60	20-34	2-12
	24-28	Very channery silt loam, channery silt loam.	SM, SC, GC, GM	A-2, A-4, A-1, A-3	10-40	30-75	10-60	9-55	7-50	<28	NP-8
	28	Weathered bedrock	---	---	---	---	---	---	---	---	---
30B*:											
Nicholson	0-10	Silt loam	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	80-95	25-35	5-10
	10-23	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	95-100	85-100	80-100	25-45	5-20
	23-36	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	90-100	80-100	75-95	25-45	5-20
	36-58	Silty clay, clay, channery clay.	CH, CL, ML, MH	A-7	0-10	80-100	70-100	60-100	55-95	34-70	16-40
Duffield	0-10	Silt loam	ML, CL, CL-ML	A-4, A-6, A-7	0	85-100	85-100	80-100	70-95	20-50	5-20
	10-65	Silty clay loam, silty clay, shaly loam.	ML, CL, MH, CH	A-4, A-6, A-7	0-10	65-100	60-100	55-100	55-95	30-55	8-22
	65-88	Shaly silt loam, loam, clay.	MH, GM, SM, ML	A-7, A-5	0-20	65-100	50-95	45-90	40-90	40-60	9-29
31B	0-7	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-100	75-100	70-100	55-95	25-38	5-16
Oaklet	7-27	Clay	CH	A-7	0-10	80-100	75-100	70-100	65-95	60-90	35-65
	27-90	Clay, silty clay	CH	A-7	0-10	80-100	75-100	70-100	65-95	60-85	35-60
32B*:											
Oaklet	0-7	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-100	75-100	70-100	55-95	25-38	5-16
	7-27	Clay	CH	A-7	0-10	80-100	75-100	70-100	65-95	60-90	35-65
	27-90	Clay, silty clay	CH	A-7	0-10	80-100	75-100	70-100	65-95	60-85	35-60

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
32B*:											
Carbo	0-7	Silty clay loam	CL	A-6, A-7	0-2	95-100	90-100	85-95	75-85	30-50	10-15
	7-37	Clay	CH	A-7	0-5	95-100	85-100	80-95	70-90	60-80	35-55
	37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
33B	0-8	Silty clay loam	CL, CL-ML	A-4, A-6	0	90-100	85-100	75-100	65-90	24-38	5-16
Pagebrook	8-26	Clay, silty clay, cherty clay loam.	CH, MH	A-7	0	60-100	50-100	45-100	40-95	50-90	30-65
	26-57	Clay, silty clay, very cherty clay loam.	CH, MH	A-7	0	55-100	45-95	35-95	30-90	50-80	30-50
	57-92	Clay, silty clay, very cherty clay loam.	CH, MH	A-7	0	50-100	40-95	35-95	30-90	50-75	30-45
	92	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
34*.											
Pits											
35B, 35C, 36B,											
36C	0-9	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-100	75-100	45-80	30-75	25-35	5-15
Poplimento	9-36	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-5	75-100	70-100	65-100	50-80	45-90	28-62
	36-58	Shaly silty clay loam, shaly silty clay, clay.	CL, CH, GC	A-7	0-10	45-90	35-85	35-85	30-80	42-85	26-58
	58-73	Shaly silty clay, very shaly silty clay, very shaly silty clay loam.	CL, CH, GC	A-6, A-7	0-15	30-80	20-70	20-70	15-65	35-65	20-45
37B*:											
Poplimento	0-7	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-100	75-100	45-80	30-75	25-35	5-15
	7-36	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-5	75-100	70-100	65-100	50-80	45-90	28-62
	36-47	Shaly silty clay loam, shaly silty clay, clay.	CL, CH, GC	A-7	0-10	45-90	35-85	35-85	30-80	42-85	26-58
	47-73	Shaly silty clay, very shaly silty clay, very shaly silty clay loam.	CL, CH, GC	A-6, A-7	0-15	30-80	20-70	20-70	15-65	35-65	20-45
Rock outcrop.											
38B*, 38C*, 38D2* 39B*, 39C*, 39D2*:											
Poplimento	0-9	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-100	75-100	45-80	30-75	25-35	5-15
	9-36	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-5	75-100	70-100	65-100	50-80	45-90	28-62
	36-58	Shaly silty clay loam, shaly silty clay, clay.	CL, CH, GC	A-7	0-10	45-90	35-85	35-85	30-80	42-85	20-58
	58-73	Shaly silty clay, very shaly silty clay, very shaly silty clay loam.	CL, CH, GC	A-6, A-7	0-15	30-80	20-70	20-70	15-65	35-65	20-45

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
38B*, 38C*, 38D2* 39B*, 39C*, 39D2*: Webbtown	0-8	Shaly silt loam	CL, SC, CL-ML, SM-SC	A-2, A-4, A-6	0-3	65-80	55-75	30-70	25-65	20-35	5-15
	8-34	Shaly silt loam, shaly silty clay loam, very shaly silt loam.	GC, SC GP-GC	A-4, A-6, A-7	0-3	30-65	20-50	12-45	10-42	25-45	8-22
	34-50	Shaly silty clay, shaly clay, very shaly clay.	GC, SC, CH GP-GC	A-7	0-5	30-65	20-55	12-52	10-52	45-65	25-42
	50-72	Very shaly silt loam, very shaly silty clay loam, very shaly clay.	GC, SC, GP-GC	A-2	2-10	30-75	15-35	10-30	8-25	25-60	10-42
40*: Quarries.											
Dumps.											
41C*: Rock outcrop.											
Catoctin	0-10	Cobbly silt loam	ML, CL, GM, GC	A-4, A-2	20-50	50-70	45-65	40-60	30-55	<30	NP-8
	6-20	Channery silt loam, channery silty clay loam, cobbly silty clay loam.	SM, SC, CL, GM	A-2, A-4, A-6	0-25	50-80	35-75	30-60	25-60	20-34	2-12
	20-29	Very channery silt loam, channery silt loam.	SM, SC, GC, GM	A-2, A-4, A-1, A-3	10-40	30-75	10-60	9-55	7-50	<28	NP-8
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---
42C*: Rock outcrop.											
Dekalb	0-8	Very stony sandy loam.	SM, GM, ML, CL-ML	A-2, A-4, A-1	10-30	50-90	45-80	40-75	20-55	10-32	NP-9
	8-25	Channery sandy loam, channery loam, very channery sandy loam.	SM, GM, ML, GM-GC	A-2, A-4, A-1	5-40	50-85	40-75	40-75	20-55	15-32	NP-9
	25-33	Channery sandy loam, flaggy sandy loam, very flaggy loamy sand.	SM, GM, SC, GC	A-2, A-4, A-1	10-50	45-85	25-75	20-65	15-40	15-32	NP-9
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
43C*: Rock outcrop.											
Opequon	0-8	Silty clay	ML, CL, MH	A-6, A-7	0-5	85-100	80-100	80-100	75-95	30-55	10-30
	8-17	Clay, silty clay.	ML, CH, MH, CL, ML	A-6, A-7	0-10	80-100	60-100	60-100	55-95	35-65	15-40
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
44B, 45B--------- Swimley	0-9	Silt loam---------	CL, CL-ML	A-4, A-6	0	85-100	85-100	75-100	60-95	24-38	5-16
	9-55	Clay--------------	CH	A-7	0	85-100	85-100	80-100	75-95	50-70	30-45
	55-99	Clay--------------	CH	A-7	0	85-100	85-100	80-100	80-95	55-75	35-50
46B*, 47B*, 47C*: Swimley---------	0-9	Silt loam---------	CL, CL-ML	A-4, A-6	0	85-100	85-100	75-100	60-95	24-38	5-16
	9-55	Clay--------------	CH	A-7	0	85-100	85-100	80-100	75-95	50-70	30-45
	55-99	Clay--------------	CH	A-7	0	85-100	85-100	80-100	80-95	55-75	35-50
Hagerstown------	0-6	Silt loam---------	CL, CL-ML	A-4, A-6, A-7	0-15	85-100	80-100	80-100	70-95	25-50	5-25
	6-52	Clay, silty clay, silty clay loam.	CH, CL	A-7, A-6	0-5	85-100	80-100	75-100	75-95	30-65	15-40
	52	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
48B*: Swimley---------	0-9	Silt loam---------	CL, CL-ML	A-4, A-6	0	85-100	85-100	75-100	60-95	24-38	5-16
	9-55	Clay--------------	CH	A-7	0	85-100	85-100	80-100	75-95	50-70	30-45
	55-99	Clay--------------	CH	A-7	0	85-100	85-100	80-100	80-95	55-75	35-50
Rock outcrop.											
49B-------------- Thurmont	0-13	Loam--------------	SM, ML, CL, SM-SC	A-2, A-4	0-3	80-100	75-100	55-70	25-65	<30	NP-10
	13-48	Clay loam, loam.	SC, CL	A-2, A-6, A-7	0-5	80-100	70-90	65-80	35-65	30-45	12-20
	48-68	Sandy loam, sandy clay loam.	SC	A-2, A-6, A-7	0-5	75-90	70-90	45-75	30-45	30-45	12-25
50B-------------- Thurmont	0-9	Gravelly loam.	SM, ML, CL, SM-SC	A-2, A-4	0-3	75-90	50-75	35-65	20-55	<30	NP-10
	9-36	Gravelly loam, gravelly clay loam.	SC, CL	A-2, A-6, A-7	2-20	75-90	55-75	45-70	25-55	30-45	12-20
	36-48	Gravelly sandy loam, gravelly sandy clay loam.	SC	A-2, A-6, A-7	2-20	75-90	55-75	35-60	20-40	30-45	12-25
	48-60	Cobbly sandy loam, gravelly sandy clay loam.	SM, SM-SC	A-1, A-2	15-40	70-85	45-75	30-50	15-35	<20	NP-7
51B-------------- Timberville	0-9	Silt loam---------	ML, CL-ML, SM-SC	A-4	0-3	75-100	75-100	55-95	35-85	<25	NP-7
	9-31	Silt loam, silty clay loam, cherty loam.	CL, CL-ML, GC, GM-GC	A-4, A-6	0-5	55-100	50-100	40-90	35-85	15-40	5-20
	31-81	Clay, silty clay loam, cherty clay loam.	CL, CH, SC, GC	A-6, A-7	0-10	55-95	50-95	45-90	40-85	35-60	14-32
52B*. Udipsamments											
53*, 54C*. Udorthents											
55D*: Udults.											
Udalfs.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
56---------- Weaver	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	85-95	75-90	20-35	4-15
	8-71	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	75-100	70-100	55-95	51-90	25-40	6-15
57C2*, 57D2*: Webbtown--------	0-5	Shaly silt loam	CL, SC, CL-ML, SM-SC	A-2, A-4, A-6	0-3	65-80	55-75	30-70	25-65	20-35	5-15
	5-34	Shaly silt loam, shaly silty clay loam, very shaly silt loam.	GC, SC, GP-GC	A-4, A-6, A-7	0-3	30-65	20-50	12-45	10-42	25-45	8-22
	34-38	Shaly silty clay, shaly clay, very shaly clay.	GC, SC, CH GP-GC	A-7	0-5	30-65	20-55	12-52	10-52	45-65	25-42
	38-72	Very shaly silt loam, very shaly silty clay loam, very shaly clay.	GC, SC, GP-GC	A-2	2-10	30-75	15-35	10-30	8-25	25-60	10-42
Poplimento------	0-5	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-100	75-100	45-80	30-75	25-45	5-15
	5-36	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-5	75-100	70-100	65-100	50-80	45-90	28-62
	36-41	Shaly silty clay loam, shaly silty clay, clay.	CL, CH, GC	A-7	0-10	45-90	35-80	35-85	30-80	42-85	26-58
	41-73	Shaly silty clay, very shaly silty clay, very shaly silty clay loam.	CL, CH, GC	A-6, A-7	0-15	30-80	20-70	20-70	15-65	35-65	20-45
Rock outcrop.											
58D*: Weikert---------	0-5	Shaly silt loam shaly loam.	GM, ML, SM	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	5-15	Very shaly silt loam.	GM, GP-GM	A-1, A-2	0-20	15-60	10-55	5-45	5-35	28-36	3-9
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Berks----------	0-5	Shaly silt loam	GM, ML, GC, SC	A-2, A-4	0-20	50-80	45-70	40-60	30-55	25-36	5-10
	5-18	Shaly loam, very shaly loam, shaly silt loam.	GM, GC, SM, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	18-22	Very shaly loam, very shaly silt loam.	GM, SM	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	22	Weathered bedrock	---	---	---	---	---	---	---	---	---
59B---------- Whiteford	0-5	Silt loam--------	ML	A-4	0-10	80-100	70-100	65-95	50-90	18-28	2-10
	5-29	Silty clay loam, silt loam, slaty silty clay loam.	ML, CL, GM	A-4, A-6, A-7	0-10	65-100	60-100	55-100	40-95	28-38	12-20
	29-54	Slaty silt loam, slaty silty clay loam, very slaty silty clay loam.	GM, GC, ML, CL	A-2, A-4, A-6	0-15	25-60	20-55	20-55	20-50	28-38	12-20
	54	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
1B*, 1C*:										
Berks	0-7	5-23	1.20-1.50	0.6-6.0	0.08-0.12	4.5-6.0	Low	0.24	3	2-3
	7-25	5-32	1.20-1.60	0.6-2.0	0.04-0.10	4.5-6.0	Low	0.17		
	25-34	5-20	1.20-1.60	2.0-6.0	0.04-0.10	4.5-6.0	Low	0.17		
	34	---	---	---	---	---	---	---		
Berks Variant	0-8	5-23	1.20-1.50	2.0-6.0	0.06-0.15	4.5-6.0	Low	0.28	3	2-4
	8-24	5-27	1.20-1.50	0.06-0.2	0.04-0.15	4.5-6.0	Low	0.28		
	24-32	5-27	1.20-1.50	<0.06	0.04-0.10	4.5-6.0	Low	0.17		
	32	---	---	---	---	---	---	---		
2B, 2C	0-11	10-25	1.20-1.50	0.6-6.0	0.14-0.19	4.5-5.5	Low	0.32	4	1-2
Braddock	11-42	35-55	1.20-1.50	0.6-2.0	0.14-0.19	4.5-5.5	Moderate	0.24		
	42-74	25-40	1.20-1.50	0.6-6.0	0.06-0.12	4.5-5.5	Low	0.24		
3D	0-8	10-25	1.00-1.20	0.6-6.0	0.14-0.19	4.5-5.5	Low	0.24	4	1-2
Braddock	8-33	35-55	1.20-1.50	0.6-2.0	0.14-0.19	4.5-5.5	Moderate	0.24		
	33-74	25-40	1.20-1.50	0.6-6.0	0.06-0.12	4.5-5.5	Low	0.24		
4*	0-7	27-35	1.30-1.40	0.6-2.0	0.14-0.19	7.4-8.4	Low	0.37	3	2-4
Buckton	7-48	18-35	1.30-1.50	0.6-2.0	0.14-0.19	7.4-8.4	Low	0.28		
	48-77	5-15	1.30-1.50	0.6-6.0	0.06-0.14	7.4-8.4	Low	0.28		
5B*, 5C*:										
Carbo	0-7	20-40	1.20-1.40	0.6-2.0	0.16-0.19	4.5-7.3	Moderate	0.37	2	.5-2
	7-37	60-80	1.30-1.50	0.06-0.2	0.10-0.14	5.6-7.8	High	0.24		
	37	---	---	---	---	---	---	---		
Opequon	0-8	27-45	1.20-1.50	0.2-2.0	0.16-0.21	5.6-7.8	High	0.37	2	.5-2
	8-17	35-65	1.40-1.70	0.2-0.6	0.12-0.16	5.6-7.8	High	0.28		
	17	---	---	---	---	---	---	---		
Rock outcrop.										
6B, 6C	0-7	5-20	1.20-1.45	0.6-2.0	0.18-0.24	4.5-5.5	Low	0.28	3	.5-2
Cardiff	7-35	10-30	1.20-1.45	0.6-2.0	0.12-0.18	4.5-5.5	Low	0.28		
	35-46	10-35	1.20-1.45	2.0-6.0	0.02-0.06	4.5-5.5	Low	0.28		
	46	---	---	---	---	---	---	---		
7D*:										
Cataska	0-3	12-22	1.30-1.40	2.0-6.0	0.10-0.14	4.5-5.5	Low	0.15	1	.5-2
	3-13	12-22	1.30-1.45	0.6-2.0	0.04-0.09	4.5-5.5	Low	0.15		
	13-21	---	---	---	---	---	---	---		
	21	---	---	---	---	---	---	---		
Cardiff	0-6	5-20	1.20-1.45	0.6-2.0	0.18-0.24	4.5-5.5	Low	0.28	3	.5-2
	6-32	10-30	1.20-1.45	0.6-2.0	0.12-0.18	4.5-5.5	Low	0.28		
	32-42	10-25	1.20-1.45	2.0-6.0	0.02-0.06	4.5-5.5	Low	0.28		
	42	---	---	---	---	---	---	---		
8D*:										
Catoctin	0-8	5-20	1.20-1.50	2.0-6.0	0.11-0.16	5.1-6.5	Low	0.24	2	2-3
	6-20	10-35	1.20-1.50	2.0-6.0	0.08-0.16	5.1-6.5	Low	0.24		
	20-29	10-25	1.20-1.50	2.0-6.0	0.04-0.15	5.6-7.3	Low	0.24		
	29	---	---	---	---	---	---	---		
Myersville	0-7	5-20	1.20-1.50	2.0-6.0	0.12-0.18	5.1-6.0	Low	0.32	4	1-2
	7-38	18-35	1.20-1.50	0.6-2.0	0.14-0.18	5.1-6.0	Low	0.32		
	38-62	10-32	1.20-1.50	0.6-2.0	0.08-0.16	5.1-6.0	Low	0.32		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
9D*:										
Catoctin	0-6	5-20	1.20-1.50	2.0-6.0	0.14-0.20	5.1-6.5	Low	0.32	2	2-3
	6-20	10-35	1.20-1.50	2.0-6.0	0.08-0.16	5.1-6.5	Low	0.24		
	20-29	10-25	1.20-1.50	2.0-6.0	0.04-0.15	5.6-7.3	Low	0.24		
	29	---	---	---	---	---	---	---		
Myersville	0-7	5-20	1.20-1.50	2.0-6.0	0.12-0.18	5.1-6.0	Low	0.32	4	1-2
	7-38	18-35	1.20-1.50	0.6-2.0	0.14-0.18	5.1-6.0	Low	0.32		
	38-62	10-32	1.20-1.50	0.6-2.0	0.08-0.16	5.1-6.0	Low	0.32		
10*	0-9	8-20	1.20-1.40	0.6-2.0	0.13-0.18	6.1-7.3	Low	0.32	5	2-4
Chagrin	9-42	18-30	1.20-1.50	0.6-2.0	0.14-0.20	6.1-7.3	Low	0.32		
	42-72	5-25	1.20-1.40	0.6-2.0	0.08-0.20	6.1-7.3	Low	0.32		
11B	0-10	15-27	1.20-1.40	0.6-2.0	0.10-0.14	3.6-5.5	Low	0.20	4	2-4
Clymer	10-30	18-30	1.20-1.50	0.6-2.0	0.08-0.14	3.6-5.5	Low	0.15		
	30-62	15-27	1.20-1.40	0.6-2.0	0.04-0.08	3.6-5.5	Low	0.15		
12D, 12E	0-8	10-20	1.20-1.50	6.0-20	0.08-0.12	3.6-5.5	Low	0.17	3	.5-2
Dekalb	8-31	7-18	1.20-1.50	2.0-6.0	0.06-0.12	3.6-5.5	Low	0.17		
	31-39	5-15	1.20-1.50	>6.0	0.05-0.10	3.6-5.5	Low	0.17		
	39	---	---	---	---	---	---	---		
13D, 13E	0-8	10-20	1.20-1.50	6.0-20	0.08-0.12	3.6-5.5	Low	0.24	3	.5-2
Dekalb	8-31	7-18	1.20-1.50	2.0-6.0	0.06-0.12	3.6-5.5	Low	0.17		
	31-39	5-15	1.20-1.50	>6.0	0.05-0.10	3.6-5.5	Low	0.17		
	39	---	---	---	---	---	---	---		
14C*:										
Dekalb	0-8	10-20	1.20-1.50	6.0-20	0.08-0.12	3.6-5.5	Low	0.17	3	.5-2
	8-31	7-18	1.20-1.50	2.0-6.0	0.06-0.12	3.6-5.5	Low	0.17		
	31-39	5-15	1.20-1.50	>6.0	0.05-0.10	3.6-5.5	Low	0.17		
	39	---	---	---	---	---	---	---		
Hazleton	0-8	7-18	1.20-1.40	2.0-6.0	0.10-0.14	3.6-5.5	Low	0.17	4	.5-2
	8-29	7-18	1.20-1.40	2.0-6.0	0.08-0.12	3.6-5.5	Low	0.17		
	29-55	5-15	1.20-1.40	2.0-20	0.04-0.10	3.6-5.5	Low	0.17		
15B*, 15C*:										
Endcav	0-18	30-40	1.20-1.40	0.6-2.0	0.15-0.20	5.1-7.3	Moderate	0.37	2	.5-2
	18-42	35-80	1.30-1.50	0.06-0.2	0.10-0.14	6.1-7.8	High	0.20		
	42-64	35-50	1.30-1.50	0.06-0.2	0.10-0.14	5.1-7.8	High	0.20		
	64	---	---	---	---	---	---	---		
Dandridge	0-5	30-45	1.40-1.50	0.6-2.0	0.08-0.14	6.1-7.8	Low	0.17	1	.5-2
	5-17	35-50	1.40-1.55	0.2-0.6	0.06-0.10	6.1-7.8	Moderate	0.17		
	17	---	---	---	---	---	---	---		
16B*. Fluvaquents										
17B*:										
Hagerstown	0-6	15-35	1.20-1.40	0.6-6.0	0.16-0.24	4.5-5.5	Low	0.32	4	2-4
	6-52	23-60	1.20-1.60	0.6-2.0	0.10-0.24	5.1-7.8	Moderate	0.28		
	52	---	---	---	---	---	---	---		
Opequon	0-8	27-45	1.20-1.50	0.2-2.0	0.16-0.21	5.6-7.8	High	0.37	2	.5-2
	8-17	35-65	1.40-1.70	0.2-0.6	0.12-0.16	5.6-7.8	High	0.28		
	17	---	---	---	---	---	---	---		
Rock outcrop.										
18	0-12	30-50	1.20-1.40	0.2-0.6	0.15-0.22	7.4-8.4	Moderate	0.32	3	2-4
Hollywood	12-72	40-60	1.20-1.50	<0.06	0.12-0.18	7.4-8.4	High	0.37		
19D	0-14	7-27	1.20-1.40	0.6-6.0	0.10-0.14	3.6-5.5	Low	0.28	4	1-2
Laidig	14-32	18-35	1.30-1.50	0.6-6.0	0.08-0.12	3.6-5.5	Low	0.28		
	32-60	18-35	1.60-1.70	0.2-0.6	0.06-0.10	3.6-5.5	Low	0.17		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
20D	0-14	7-27	1.20-1.40	0.6-6.0	0.08-0.12	3.6-5.5	Low	0.28	4	1-2
Laidig	14-32	18-35	1.30-1.50	0.6-6.0	0.08-0.10	3.6-5.5	Low	0.28		
	32-60	18-35	1.60-1.90	0.2-0.6	0.06-0.10	3.6-5.5	Low	0.17		
21B	0-10	2-6	1.20-1.40	>6.0	0.04-0.08	5.1-6.0	Low	0.17	5	1-2
Lakin	10-50	3-8	1.30-1.50	>6.0	0.04-0.08	5.1-6.0	Low	0.17		
	50-70	1-3	1.30-1.50	>6.0	0.04-0.08	5.1-6.0	Low	0.17		
22C, 22D	0-7	10-25	1.00-1.20	0.6-6.0	0.13-0.15	4.5-6.0	Low	0.17	4	2-3
Lew	7-63	28-40	1.20-1.50	0.6-2.0	0.11-0.16	4.5-6.0	Moderate	0.17		
23*	0-9	15-27	1.20-1.40	0.6-2.0	0.20-0.24	5.1-7.3	Low	0.37	5	2-4
Lobdell	9-26	18-30	1.25-1.60	0.6-2.0	0.17-0.22	5.1-7.3	Low	0.37		
	26-64	15-30	1.20-1.60	0.6-2.0	0.12-0.18	5.6-7.3	Low	0.37		
24	0-9	28-40	1.40-1.60	0.2-0.6	0.20-0.22	6.6-7.3	Moderate	0.43	3	2-4
McGary	9-60	35-50	1.60-1.75	0.06-0.2	0.11-0.13	6.1-8.4	High	0.32		
25B	0-9	10-27	1.20-1.40	0.6-2.0	0.18-0.24	4.5-5.5	Low	0.43	3	.5-2
Monongahela	9-21	18-35	1.30-1.50	0.6-2.0	0.14-0.18	4.5-5.5	Low	0.43		
	21-60	18-35	1.60-1.90	0.06-0.2	0.08-0.12	4.5-5.5	Low	0.43		
26B*:										
Monongahela	0-9	10-27	1.20-1.40	0.6-2.0	0.16-0.22	4.5-5.5	Low	0.37	3	.5-2
	9-21	18-35	1.30-1.50	0.6-2.0	0.14-0.18	4.5-5.5	Low	0.43		
	21-60	18-35	1.60-1.90	0.06-0.2	0.08-0.12	4.5-5.5	Low	0.43		
Braddock	0-11	10-25	1.20-1.50	0.6-6.0	0.12-0.18	4.5-5.5	Low	0.24	4	.5-1
	11-41	35-55	1.20-1.50	0.6-2.0	0.14-0.19	4.5-5.5	Moderate	0.24		
	41-74	25-40	1.20-1.50	0.6-6.0	0.06-0.12	4.5-5.5	Low	0.24		
26C*:										
Monongahela	0-7	10-27	1.20-1.40	0.6-2.0	0.16-0.22	4.5-5.5	Low	0.37	3	.5-2
	7-18	18-35	1.30-1.50	0.6-2.0	0.14-0.18	4.5-5.5	Low	0.43		
	18-60	18-35	1.60-1.90	0.06-0.2	0.08-0.12	4.5-5.5	Low	0.43		
Braddock	0-8	10-25	1.20-1.50	0.6-6.0	0.12-0.18	4.5-5.5	Low	0.24	4	.5-1
	8-41	35-55	1.20-1.50	0.6-2.0	0.14-0.19	4.5-5.5	Moderate	0.24		
	41-74	25-40	1.20-1.50	0.6-6.0	0.06-0.12	4.5-5.5	Low	0.24		
27B*:										
Monongahela	0-9	10-27	1.20-1.40	0.6-2.0	0.18-0.24	4.5-5.5	Low	0.43	3	.5-2
	9-21	18-35	1.30-1.50	0.6-2.0	0.14-0.18	4.5-5.5	Low	0.43		
	21-60	18-35	1.60-1.90	0.06-0.2	0.08-0.12	4.5-5.5	Low	0.43		
Zoar	0-12	15-30	1.20-1.40	0.6-2.0	0.15-0.18	4.5-5.5	Low	0.43	3	1-2
	12-73	35-50	1.40-1.70	0.06-0.2	0.08-0.12	5.1-5.5	Moderate	0.37		
28B*:										
Myersville	0-10	5-20	1.20-1.50	2.0-6.0	0.14-0.20	5.1-6.0	Low	0.37	4	2-3
	10-35	18-35	1.20-1.50	0.6-2.0	0.14-0.18	5.1-6.0	Low	0.32		
	35-62	10-32	1.20-1.50	0.6-2.0	0.08-0.16	5.1-6.0	Low	0.32		
Catoctin	0-8	5-20	1.20-1.50	2.0-6.0	0.14-0.20	5.1-6.5	Low	0.32	2	2-3
	8-24	10-35	1.20-1.50	2.0-6.0	0.08-0.16	5.1-6.5	Low	0.24		
	24-32	10-25	1.20-1.50	2.0-6.0	0.04-0.15	5.6-7.3	Low	0.24		
	32	---	---	---	---	---	---	---		
28C*:										
Myersville	0-8	5-20	1.20-1.50	2.0-6.0	0.14-0.20	5.1-6.0	Low	0.37	4	2-3
	8-40	18-35	1.20-1.50	0.6-2.0	0.14-0.18	5.1-6.0	Low	0.32		
	40-62	10-32	1.20-1.50	0.6-2.0	0.08-0.16	5.1-6.0	Low	0.32		
Catoctin	0-6	5-20	1.20-1.50	2.0-6.0	0.14-0.20	5.1-6.5	Low	0.32	2	2-3
	6-24	10-35	1.20-1.50	2.0-6.0	0.08-0.16	5.1-6.5	Low	0.24		
	24-28	10-25	1.20-1.50	2.0-6.0	0.04-0.15	5.6-7.3	Low	0.24		
	28	---	---	---	---	---	---	---		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
29C*:										
Myersville------	0-8	5-20	1.20-1.50	2.0-6.0	0.14-0.20	5.1-6.0	Low----------	0.32	4	2-3
	8-40	18-35	1.20-1.50	0.6-2.0	0.14-0.18	5.1-6.0	Low----------	0.32		
	40-62	10-32	1.20-1.50	0.6-2.0	0.08-0.16	5.1-6.0	Low----------	0.32		
Catoctin--------	0-6	5-20	1.20-1.50	2.0-6.0	0.14-0.20	5.1-6.5	Low----------	0.32	2	2-3
	6-24	10-35	1.20-1.50	2.0-6.0	0.08-0.16	5.1-6.5	Low----------	0.24		
	24-28	10-25	1.20-1.50	2.0-6.0	0.04-0.15	5.6-7.3	Low----------	0.24		
	28	---	---	---	---	---	----------	----		
30B*:										
Nicholson-------	0-10	12-30	1.20-1.40	0.6-2.0	0.19-0.23	4.5-6.5	Low----------	0.43	3	1-2
	10-23	18-35	1.60-1.80	0.6-2.0	0.18-0.22	4.5-6.5	Low----------	0.43		
	23-36	18-35	1.60-1.80	0.06-0.2	0.07-0.12	4.5-6.5	Low----------	0.43		
	36-58	40-60	1.40-1.60	0.06-0.6	0.07-0.12	5.1-7.8	Moderate-----	0.37		
Duffield--------	0-10	15-30	1.10-1.40	0.6-2.0	0.16-0.22	5.1-7.3	Low----------	0.32	4	1-2
	10-65	20-42	1.30-1.60	0.6-2.0	0.14-0.20	5.1-7.3	Moderate-----	0.28		
	65-88	18-41	1.30-1.60	0.6-2.0	0.14-0.20	5.1-6.5	Moderate-----	0.28		
31B---------------	0-7	20-40	1.20-1.40	0.6-2.0	0.10-0.19	4.5-6.5	Low----------	0.37	4	1-2
Oaklet	7-27	60-80	1.30-1.60	0.06-0.2	0.08-0.16	4.5-6.5	High---------	0.28		
	27-90	55-80	1.30-1.60	0.06-0.2	0.08-0.16	5.1-8.4	High---------	0.28		
32B*:										
Oaklet----------	0-7	20-40	1.20-1.40	0.6-2.0	0.10-0.19	4.5-6.5	Low----------	0.37	4	1-2
	7-27	60-80	1.30-1.60	0.06-0.2	0.07-0.14	4.5-6.5	High---------	0.28		
	27-90	55-80	1.30-1.60	0.06-0.2	0.07-0.14	5.1-8.4	High---------	0.28		
Carbo------------	0-7	20-40	1.20-1.40	0.6-2.0	0.16-0.19	4.5-7.3	Moderate-----	0.37	2	.5-2
	7-37	60-80	1.30-1.50	0.06-0.2	0.10-0.14	5.6-7.8	High---------	0.24		
	37	---	---	---	---	---	----------	----		
33B---------------	0-8	25-40	1.20-1.45	0.6-2.0	0.08-0.18	5.1-7.8	Low----------	0.37	3	2-3
Pagebrook	8-26	45-60	1.30-1.60	0.06-0.2	0.08-0.14	5.1-7.8	High---------	0.28		
	26-57	40-50	1.30-1.55	0.06-0.6	0.08-0.14	6.1-8.4	High---------	0.28		
	57-92	35-50	1.35-1.55	0.06-0.6	0.08-0.14	6.1-8.4	Moderate-----	0.28		
	92	---	---	---	---	---	----------	----		
34*.										
Pits										
35B, 35C, 36B,										
36C---------------	0-9	17-27	1.20-1.35	0.6-2.0	0.15-0.22	4.5-6.0	Low----------	0.32	4	.5-2
Poplimento	9-36	35-60	1.30-1.60	0.2-0.6	0.10-0.18	4.5-6.0	High---------	0.24		
	36-58	30-55	1.30-1.55	0.2-0.6	0.07-0.17	5.1-6.5	High---------	0.24		
	58-73	27-50	1.25-1.50	0.2-0.6	0.05-0.15	5.1-6.5	Moderate-----	0.24		
37B*:										
Poplimento------	0-7	17-27	1.20-1.35	0.6-2.0	0.15-0.22	4.5-6.0	Low----------	0.32	4	.5-2
	7-36	35-60	1.30-1.60	0.2-0.6	0.10-0.18	4.5-6.0	High---------	0.24		
	36-47	30-55	1.30-1.55	0.2-0.6	0.07-0.17	5.1-6.5	High---------	0.24		
	47-73	27-50	1.25-1.50	0.2-0.6	0.05-0.15	5.1-6.5	Moderate-----	0.24		
Rock outcrop.										
38B*, 38C*, 38D2*										
39B*, 39C*,										
39D2*:										
Poplimento------	0-9	17-27	1.20-1.35	0.6-2.0	0.15-0.22	4.5-6.0	Low----------	0.32	4	.5-2
	9-36	35-60	1.30-1.60	0.2-0.6	0.10-0.18	4.5-6.0	High---------	0.24		
	36-58	30-55	1.30-1.55	0.2-0.6	0.07-0.17	5.1-6.5	High---------	0.24		
	58-73	27-50	1.25-1.50	0.2-0.6	0.05-0.15	5.1-6.5	Moderate-----	0.24		
Webbtown--------	0-8	15-25	1.30-1.45	0.6-2.0	0.10-0.18	5.1-6.5	Low----------	0.32	3	1-2
	8-34	20-35	1.30-1.50	0.6-2.0	0.09-0.18	5.1-6.5	Low----------	0.24		
	34-50	40-55	1.30-1.50	0.2-0.6	0.09-0.16	5.6-7.3	Moderate-----	0.24		
	50-72	20-55	1.30-1.50	0.2-2.0	0.09-0.14	5.6-7.3	Moderate-----	0.24		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
40*:										
Quarries.										
Dumps.										
41C*:										
Rock outcrop.										
Catoctin	0-6	5-20	1.20-1.50	2.0-6.0	0.11-0.16	5.1-6.5	Low	0.24	2	2-3
	6-20	10-35	1.20-1.50	2.0-6.0	0.08-0.16	5.1-6.5	Low	0.24		
	20-29	10-25	1.20-1.50	2.0-6.0	0.04-0.15	5.6-7.3	Low	0.24		
	29	---	---	---	---	---	---	---		
42C*:										
Rock outcrop.										
Dekalb	0-8	10-20	1.20-1.50	6.0-20	0.08-0.12	3.6-5.5	Low	0.24	3	.5-2
	8-25	7-18	1.20-1.50	2.0-6.0	0.06-0.12	3.6-5.5	Low	0.17		
	25-33	5-15	1.20-1.50	>6.0	0.05-0.10	3.6-5.5	Low	0.17		
	33	---	---	---	---	---	---	---		
43C*:										
Rock outcrop.										
Opequon	0-8	27-45	1.20-1.50	0.2-2.0	0.16-0.21	5.6-7.8	High	0.37	2	.5-2
	8-17	35-65	1.40-1.70	0.2-0.6	0.12-0.16	5.6-7.8	High	0.28		
	17	---	---	---	---	---	---	---		
44B, 45B	0-9	25-40	1.20-1.40	0.6-2.0	0.10-0.19	4.5-7.3	Low	0.37	4	.5-1
Swimley	9-55	60-80	1.30-1.60	0.6-2.0	0.08-0.14	4.5-7.3	Moderate	0.28		
	55-99	60-85	1.30-1.60	0.2-0.6	0.08-0.14	4.5-7.3	High	0.28		
46B*, 47B*, 47C*:										
Swimley	0-9	25-40	1.20-1.40	0.6-2.0	0.10-0.19	4.5-7.3	Low	0.37	4	.5-1
	9-55	60-80	1.30-1.60	0.6-2.0	0.08-0.14	4.5-7.3	Moderate	0.28		
	55-99	60-85	1.30-1.60	0.2-0.6	0.08-0.14	4.5-7.3	High	0.28		
Hagerstown	0-6	15-35	1.20-1.40	0.6-6.0	0.16-0.24	4.5-5.5	Low	0.32	4	2-4
	6-52	23-60	1.20-1.60	0.6-2.0	0.10-0.24	5.1-7.8	Moderate	0.28		
	52	---	---	---	---	---	---	---		
48B*:										
Swimley	0-9	25-40	1.20-1.40	0.6-2.0	0.10-0.19	4.5-7.3	Low	0.37	4	.5-1
	9-55	60-80	1.30-1.60	0.6-2.0	0.08-0.14	4.5-7.3	Moderate	0.28		
	55-99	60-85	1.30-1.60	0.2-0.6	0.08-0.14	4.5-7.3	High	0.28		
Rock outcrop.										
49B	0-13	10-25	1.20-1.40	2.0-6.0	0.10-0.15	4.5-5.5	Low	0.32	4	.5-2
Thurmont	13-48	18-35	1.30-1.50	0.6-2.0	0.13-0.19	4.5-5.5	Low	0.20		
	48-68	18-30	1.30-1.50	0.6-2.0	0.07-0.12	4.5-5.5	Low	0.20		
50B	0-9	10-25	1.20-1.40	2.0-6.0	0.10-0.15	4.5-5.5	Low	0.32	4	.5-2
Thurmont	9-36	18-35	1.30-1.50	0.6-2.0	0.13-0.18	4.5-5.5	Low	0.20		
	36-48	18-30	1.30-1.50	0.6-2.0	0.07-0.12	4.5-5.5	Low	0.20		
	48-60	10-20	1.20-1.40	0.6-2.0	0.04-0.08	4.5-5.5	Low	0.20		
51B	0-9	6-25	1.30-1.50	2.0-6.0	0.11-0.18	4.5-6.0	Low	0.32	4	2-3
Timberville	9-31	13-25	1.30-1.50	0.6-2.0	0.11-0.19	4.5-6.0	Low	0.24		
	31-81	35-60	1.40-1.60	0.6-2.0	0.14-0.18	4.5-6.0	Moderate	0.24		
52B*.										
Udipsamments										
53*, 54C*.										
Udorthents										
55D*:										
Udults.										

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
55D*:										
Udalfs.										
56	0-8	18-35	1.35-1.50	0.6-2.0	0.15-0.20	6.6-8.4	Low	0.32	5	2-4
Weaver	8-71	20-35	1.35-1.50	0.6-2.0	0.15-0.20	7.4-8.4	Low	0.32		
57C2*, 57D2*:										
Webbtown	0-5	15-25	1.30-1.45	0.6-2.0	0.10-0.18	5.1-6.5	Low	0.32	3	1-2
	5-34	20-35	1.30-1.50	0.6-2.0	0.09-0.18	5.1-6.5	Low	0.24		
	34-38	40-55	1.30-1.50	0.2-0.6	0.09-0.16	5.6-7.3	Moderate	0.24		
	38-72	20-55	1.30-1.50	0.2-2.0	0.09-0.14	5.6-7.3	Moderate	0.24		
Poplimento	0-5	17-27	1.20-1.35	0.6-2.0	0.15-0.22	4.5-6.0	Low	0.32	4	.5-2
	5-36	35-60	1.30-1.60	0.2-0.6	0.10-0.18	4.5-6.0	High	0.24		
	36-41	30-55	1.30-1.55	0.2-0.6	0.07-0.17	5.1-6.5	High	0.24		
	41-73	27-50	1.25-1.50	0.2-0.6	0.05-0.15	5.1-6.5	Moderate	0.24		
Rock outcrop.										
58D*:										
Weikert	0-5	15-27	1.20-1.40	2.0-6.0	0.08-0.14	4.5-6.0	Low	0.28	2	2-3
	5-15	15-27	1.20-1.40	2.0-6.0	0.04-0.08	4.5-6.0	Low	0.28		
	15	---	---	---	---	---	---	---		
Berks	0-5	5-23	1.20-1.50	0.6-6.0	0.08-0.12	4.5-6.0	Low	0.24	3	.2-3
	5-18	5-32	1.20-1.60	0.6-2.0	0.04-0.10	4.5-6.0	Low	0.17		
	18-22	5-20	1.20-1.60	2.0-6.0	0.04-0.10	4.5-6.0	Low	0.17		
	22	---	---	---	---	---	---	---		
59B	0-5	5-20	1.20-1.40	0.6-2.0	0.12-0.24	4.5-5.5	Low	0.32	3	.5-2
Whiteford	5-29	18-35	1.20-1.40	0.6-2.0	0.10-0.24	4.5-5.5	Low	0.28		
	29-54	18-30	1.20-1.40	0.6-2.0	0.07-0.12	4.5-5.5	Low	0.28		
	54	---	---	---	---	---	---	---		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

["Flooding," "water table," and terms such as "brief" and "perched" are explained in the text. The symbol
means more than. Absence of an entry indicates that the feature is not a concern or data were not esti

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potenti frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
1B*, 1C*:										
Berks	C	None	---	---	>6.0	---	---	20-40	Soft	Low----
Berks Variant	C	None	---	---	0.5-1.5	Perched	Sep-May	20-40	Soft	Moderat
2B, 2C, 3D----- Braddock	B	None	---	---	>6.0	---	---	>60	---	Moderat
4*----- Buckton	B	Occasional	Very brief	Dec-Jun	>6.0	---	---	>60	---	Moderat
5B*, 5C*:										
Carbo	C	None	---	---	>6.0	---	---	20-40	Hard	Moderat
Opequon	C	None	---	---	>6.0	---	---	12-20	Hard	Moderat
Rock outcrop.										
6B, 6C----- Cardiff	B	None	---	---	>6.0	---	---	40-60	Hard	Moderat
7D*:										
Cataska	D	None	---	---	>6.0	---	---	20-40	Hard	Moderat
Cardiff	B	None	---	---	>6.0	---	---	40-60	Hard	Moderat
8D*, 9D*:										
Catoctin	C	None	---	---	>6.0	---	---	20-40	Hard	Low----
Myersville	B	None	---	---	>6.0	---	---	>60	---	Moderat
10*----- Chagrin	B	Occasional	Brief-----	Nov-May	4.0-6.0	Apparent	Feb-Mar	>60	---	Moderat
11B----- Clymer	B	None	---	---	>6.0	---	---	40-60	Hard	Moderat
12D, 12E, 13D, 13E----- Dekalb	C	None	---	---	>6.0	---	---	20-40	Hard	Low----
14C*:										
Dekalb	C	None	---	---	>6.0	---	---	20-40	Hard	Low----
Hazleton	B	None	---	---	>6.0	---	---	>40	Hard	Moderat
15B*, 15C*:										
Endcav	C	None	---	---	>6.0	---	---	>40	Hard	Moderat
Dandridge	D	None	---	---	>6.0	---	---	6-20	Soft	Moderat

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potenti frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
16B*. Fluvaquents										
17B*:										
Hagerstown	C	None	---	---	>6.0	---	---	>40	Hard	Moderat
Opequon	C	None	---	---	>6.0	---	---	12-20	Hard	Moderat
Rock outcrop.										
18---------- Hollywood	D	None	---	---	>6.0	---	---	>48	Hard	Low----
19D, 20D---------- Laidig	C	None	---	---	2.5-4.0	Perched	Jan-Mar	>60	---	Moderat
21B---------- Lakin	A	None	---	---	>6.0	---	---	>60	---	Low----
22C, 22D---------- Lew	B	None	---	---	>6.0	---	---	>60	---	Moderat
23*---------- Lobdell	B	Occasional	Brief-----	Jan-Apr	2.0-3.5	Apparent	Dec-Apr	>60	---	High---
24---------- McGary	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	Moderat
25B---------- Monongahela	C	None	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderat
26B*, 26C*:										
Monongahela------	C	None	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderat
Braddock---------	B	None	---	---	>6.0	---	---	>60	---	Moderat
27B*:										
Monongahela------	C	None	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderat
Zoar----------	C	None	---	---	1.5-2.5	Perched	Dec-Apr	>60	---	Moderat
28B*, 28C*, 29C*:										
Myersville-------	B	None	---	---	>6.0	---	---	>60	---	Moderat
Catoctin---------	C	None	---	---	>6.0	---	---	20-40	Hard	Low----
30B*:										
Nicholson--------	C	None	---	---	1.5-2.5	Perched	Jan-Apr	>60	---	Moderat
Duffield---------	B	None	---	---	>6.0	---	---	>48	Soft	Moderat
31B---------- Oaklet	C	None	---	---	>6.0	---	---	>60	---	Moderat

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potenti frost actior
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
32B*:										
Oaklet	C	None	---	---	>6.0	---	---	>60	---	Moderat
Carbo	C	None	---	---	>6.0	---	---	20-40	Hard	Moderat
33B---------- Pagebrook	D	Frequent	Very brief	Oct-Mar	2.0-4.0	Apparent	Dec-Mar	>60	---	Moderat
34*. Pits										
35B, 35C, 36B, 36C---------- Poplimento	C	None	---	---	>6.0	---	---	>48	Hard	Moderat
37B*:										
Poplimento	C	None	---	---	>6.0	---	---	>48	Hard	Moderat
Rock outcrop.										
38B*, 38C*, 38D2*, 39B*, 39C*, 39D2*:										
Poplimento	C	None	---	---	>6.0	---	---	>48	Hard	Moderat
Webbtown	C	None	---	---	>6.0	---	---	>30	Hard	Moderat
40*: Quarries.										
Dumps.										
41C*: Rock outcrop.										
Catoctin	C	None	---	---	>6.0	---	---	20-40	Hard	Low----
42C*: Rock outcrop.										
Dekalb	C	None	---	---	>6.0	---	---	20-40	Hard	Low----
43C*: Rock outcrop.										
Opequon	C	None	---	---	>6.0	---	---	12-20	Hard	Moderat
44B, 45B---------- Swimley	C	None	---	---	>6.0	---	---	>60	---	Moderat
46B*, 47B*, 47C*:										
Swimley	C	None	---	---	>6.0	---	---	>60	---	Moderat
Hagerstown	C	None	---	---	>6.0	---	---	>40	Hard	Moderat

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potentifrost actior
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
48B*:										
Swimley----------	C	None--------	---	---	>6.0	---	---	>60	---	Moderat
Rock outcrop.										
49B, 50B----------	B	None--------	---	---	>4.0	Apparent	Dec-Mar	>60	---	Moderat
Thurmont										
51B----------	B	Frequent----	Very brief	Apr-Oct	>6.0	---	---	>60	---	Moderat
Timberville										
52B*.										
Udipsamments										
53*, 54C*.										
Udorthents										
55D*:										
Udults.										
Udalfs.										
56----------	C	Occasional	Very brief	Dec-Mar	1.5-2.5	Apparent	Dec-Mar	40-60	Hard	Low----
Weaver										
57C2*, 57D2*:										
Webbtown----------	C	None--------	---	---	>6.0	---	---	>30	Hard	Moderat
Poplimento-------	C	None--------	---	---	>6.0	---	---	>48	Hard	Moderat
Rock outcrop.										
58D*:										
Weikert----------	C/D	None--------	---	---	>6.0	---	---	10-20	Soft	Moderat
Berks----------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low----
59B----------	B	None--------	---	---	>6.0	---	---	40-60	Hard	Moderat
Whiteford										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Berks Variant	Loamy-skeletal, mixed, mesic Aquic Dystrochrepts
Braddock	Clayey, mixed, mesic Typic Hapludults
*Buckton	Fine-silty, mixed (calcareous), mesic Typic Udifluvents
Carbo	Very-fine, mixed, mesic Typic Hapludalfs
Cardiff	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Cataska	Loamy-skeletal, mixed, mesic, shallow Typic Dystrochrepts
Catoctin	Loamy-skeletal, mixed, mesic Ruptic-Alfic Eutrochrepts
Chagrin	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Clymer	Fine-loamy, mixed, mesic Typic Hapludults
Dandridge	Clayey-skeletal, mixed, mesic Lithic Ruptic-Alfic Eutrochrepts
Dekalb	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Duffield	Fine-loamy, mixed, mesic Ultic Hapludalfs
Endcav	Very-fine, mixed, mesic Typic Hapludalfs
Fluvaquents	Fluvaquents
Hagerstown	Fine, mixed, mesic Typic Hapludalfs
Hazleton	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
*Hollywood	Fine, montmorillonitic, thermic Typic Pelluderts
Laidig	Fine-loamy, mixed, mesic Typic Fragiudults
*Lakin	Mixed, mesic Alfic Udipsamments
Lew	Loamy-skeletal, mixed, mesic Typic Hapludults
Lobdell	Fine-loamy, mixed, mesic Fluvaquentic Eutrochrepts
*McGary	Fine, mixed, mesic Aeric Ochraqualfs
Monongahela	Fine-loamy, mixed, mesic Typic Fragiudults
Myersville	Fine-loamy, mixed, mesic Ultic Hapludalfs
Nicholson	Fine-silty, mixed, mesic Typic Fragiudalfs
Oaklet	Very-fine, mixed, mesic Typic Paleudalfs
Opequon	Clayey, mixed, mesic Lithic Hapludalfs
Pagebrook	Fine, montmorillonitic, mesic Vertic Eutrochrepts
Poplimento	Fine, mixed, mesic Ultic Hapludalfs
Swimley	Very-fine, mixed, mesic Typic Paleudalfs
Thurmont	Fine-loamy, mixed, mesic Typic Hapludults
Timberville	Clayey, mixed, mesic Typic Hapludults
Udalfs	Udalfs
Udipsamments	Udipsamments
Udorthents	Udorthents
Udults	Udults
Weaver	Fine-loamy, mixed, mesic Fluvaquentic Eutrochrepts
Webbtown	Loamy-skeletal, mixed, mesic Ruptic-Alfic Eutrochrepts
Weikert	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Whiteford	Fine-loamy, mixed, mesic Typic Hapludults
Zoar	Clayey, mixed, mesic Aquic Hapludults

*The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

* U.S. GOVERNMENT PRINTING OFFICE: 1982 -368-885/2018

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U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

THE VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

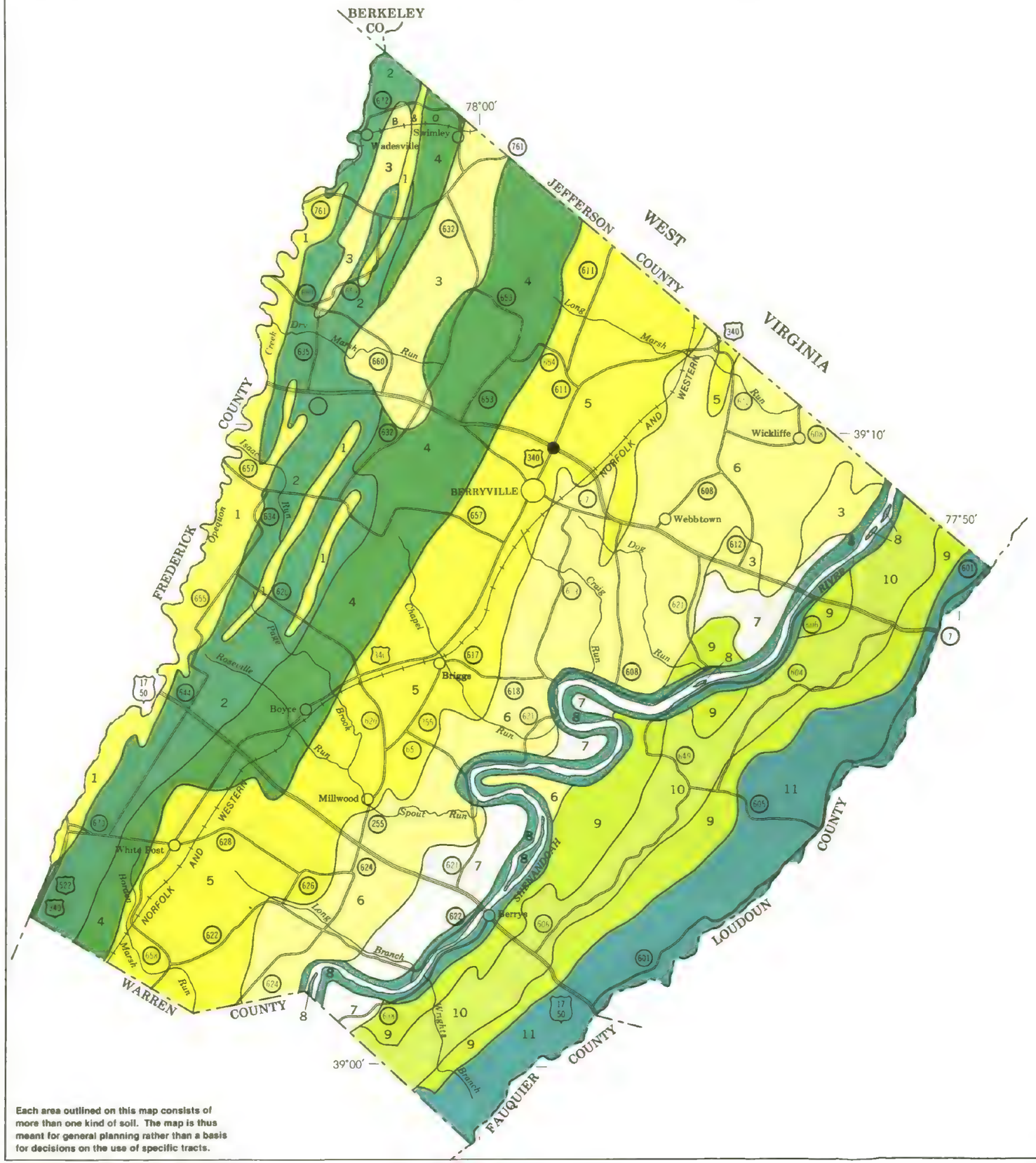
GENERAL SOIL MAP

CLARKE COUNTY, VIRGINIA

Scale 1:126,720

1 0 1 2 3 4 Miles

1 0 1 2 3 4 Kilometers



LEGEND

AREAS ON UPLANDS IN THE SHENANDOAH VALLEY

1 — Berks-Endcav-Weikert: Shallow to deep, well drained soils that have a loamy or clayey subsoil and formed in materials weathered from shale or calcareous shale; on uplands

2 — Carbo-Opequon-Oaklet: Shallow to deep, well drained soils that have a clayey subsoil and formed in materials weathered from limestone; on uplands

3 — Rock outcrop-Opequon-Swimley: Areas of Rock outcrop and shallow and deep, well drained soils that have a clayey subsoil and formed in materials weathered from limestone; on uplands

4 — Rock outcrop-Hagerstown-Swimley: Areas of Rock outcrop and deep, well drained soils that have a clayey subsoil and formed in materials weathered from limestone; on uplands

5 — Poplimento-Timberville: Deep, well drained soils that have a clayey or loamy subsoil and formed in materials weathered from interbedded limestone, shale, and siltstone or colluvium; on uplands

6 — Poplimento-Webbtown-Timberville: Deep or moderately deep, well drained soils that have a clayey or loamy subsoil and formed in materials weathered from interbedded limestone, shale, and siltstone or colluvium; on uplands

AREAS ON RIVER TERRACES AND FLOOD PLAINS IN THE SHENANDOAH VALLEY

7 — Monongahela-Braddock-Webbtown: Deep or moderately deep, moderately well drained or well drained soils that have a loamy or clayey subsoil and formed in alluvium or residuum or interbedded limestone, shale, and siltstone; on stream terraces and adjacent uplands

8 — Chagrin-Udipsamments-Lobdell: Deep, excessively drained to moderately well drained soils that are loamy or sandy throughout and formed in alluvium; on flood plains

AREAS ON UPLANDS IN THE BLUE RIDGE MOUNTAINS

9 — Dekalb-Laidig: Moderately deep or deep, well drained soils that have a loamy subsoil and formed in materials weathered from sandstone; on uplands

10 — Cardiff-Cataska-Whiteford: Deep to shallow, well drained or excessively drained soils that have a loamy subsoil and formed in materials weathered from phyllites and slates; on uplands

11 — Catoctin-Myersville-Lew: Moderately deep or deep, well drained soils that have a loamy subsoil and formed in materials weathered from greenstone residuum or colluvium from greenstone; on uplands

Compiled 1981

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

1-13642

INDEX TO MAP SHEETS

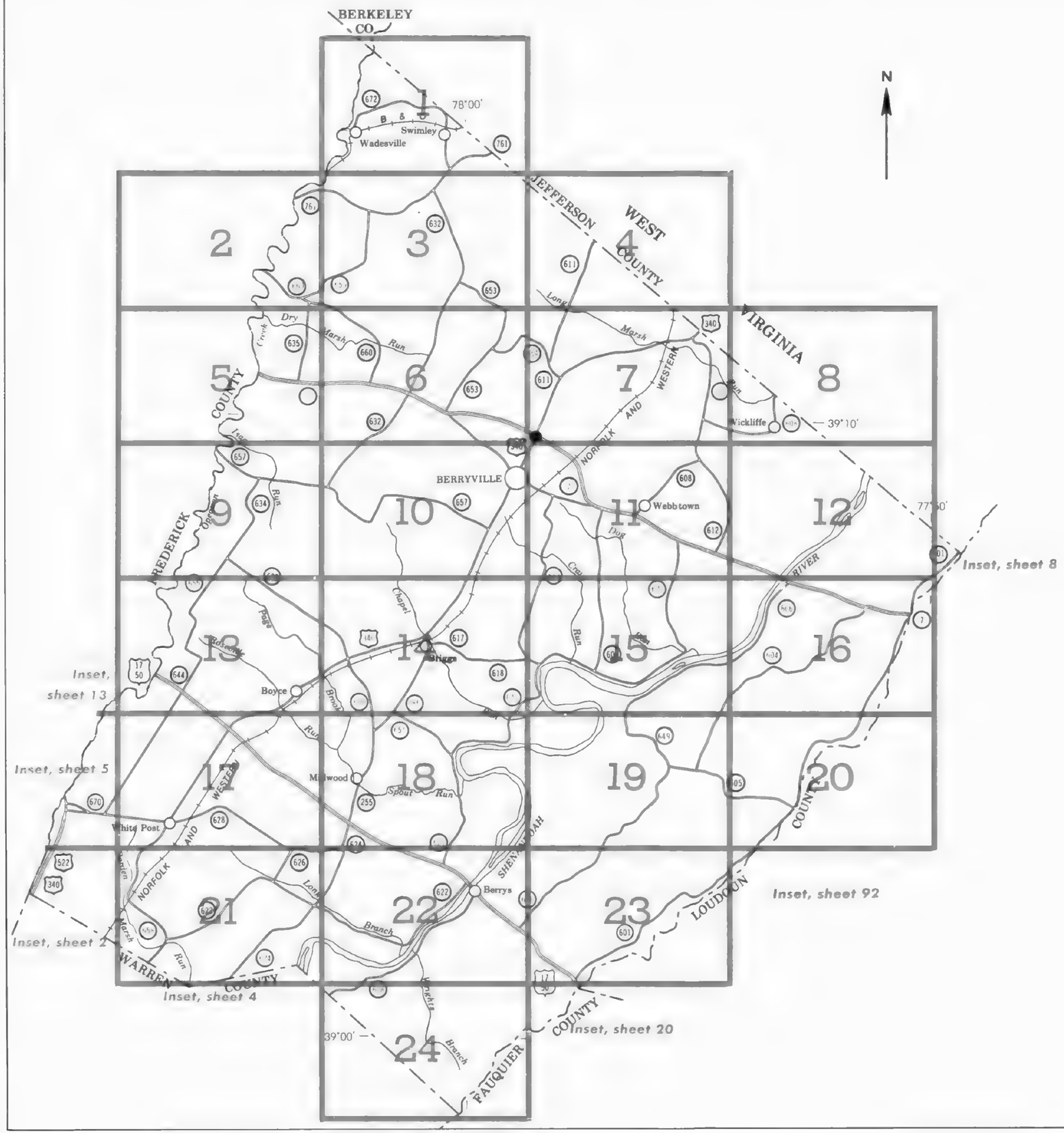
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

CLARKE COUNTY, VIRGINIA

Scale 1:126,720

1 0 1 2 3 4 Miles

1 0 1 2 3 4 Kilometers



SOIL LEGEND

1/Map symbols consists of numbers or a combination of numbers and letters (e.g., 4, 26C, or 39D2). A capital letter of A, B, C, D, or E following a number indicates the class of slope. Symbols without a slope letter are for nearly level soils, soils with a wide range in slope, or miscellaneous area. A final number of 2 following the slope letter indicates that the soil is eroded

SYMBOL	NAME
1B	Berks-Berks Variant shaly silt loams, 3 to 8 percent slopes
1C	Berks-Berks Variant shaly silt loams, 8 to 15 percent slopes
2B	Braddock loam, 3 to 8 percent slopes
2C	Braddock loam, 8 to 15 percent slopes
3D	Braddock very stony loam, 15 to 45 percent slopes
4	Buckton soils
5B	Carbo-Opequon-Rock outcrop complex, 3 to 8 percent slopes
5C	Carbo-Opequon-Rock outcrop complex, 8 to 15 percent slopes
6B	Cardiff slaty loam, 3 to 8 percent slopes
6C	Cardiff slaty loam, 8 to 15 percent slopes
7D	Cataska-Cardiff slaty loams, 15 to 45 percent slopes
8D	Catoctin-Myersville complex, 15 to 45 percent slopes
9D	Catoctin-Myersville very stony silt loams, 15 to 45 percent slopes
10	Chargrin soils
11B	Clymer channery loam, 3 to 15 percent slopes
12D	Dekalb channery sandy loam, 15 to 30 percent slopes
12E	Dekalb channery sandy loam, 30 to 50 percent slopes
13D	Dekalb very stony sandy loam, 8 to 30 percent slopes
13E	Dekalb very stony sandy loam, 30 to 50 percent slopes
14C	Dekalb-Hazleton channery sandy loams, 3 to 15 percent slopes
15B	Endcav-Dandridge complex, 3 to 8 percent slopes
15C	Endcav-Dandridge complex, 8 to 15 percent slopes
16B	Fluvaquents, 0 to 8 percent slopes
17B	Hagerstown-Opequon-Rock outcrop complex, 3 to 15 percent slopes
18	Hollywood clay loam
19D	Laidig channery loam, 8 to 25 percent slopes
20D	Laidig very stony loam, 8 to 25 percent slopes
21B	Lakin loamy sand, 3 to 8 percent slopes
22C	Lew very stony silt loam, 8 to 15 percent slopes
22D	Lew very stony silt loam, 15 to 30 percent slopes
23	Lobdell soils
24	McGary silt clay loam
25B	Monongahela loam, 3 to 8 percent slopes
26B	Monongahela-Braddock complex, 3 to 8 percent slopes
26C	Monongahela-Braddock complex, 8 to 15 percent slopes
27B	Monongahela-Zoar complex, 3 to 8 percent slopes
28B	Myersville-Catoctin silt loams, 3 to 8 percent slopes
28C	Myersville-Catoctin silt loams, 8 to 15 percent slopes
29C	Myersville-Catoctin very stony silt loams, 8 to 15 percent slopes
30B	Nicholson-Duffield silt loams, 3 to 8 percent slopes
31B	Oaklet silt loam, 3 to 8 percent slopes
32B	Oaklet-Carbo complex, rocky, 3 to 8 percent slopes
33B	Pagebrook silt clay loam, 0 to 7 percent slopes
34	Pits, sand and gravel
35B	Poplimento silt loam, 3 to 8 percent slopes
35C	Poplimento silt loam, 8 to 15 percent slopes
36B	Poplimento silt loam, rocky, 3 to 8 percent slopes
36C	Poplimento silt loam, rocky, 8 to 15 percent slopes
37B	Poplimento-Rock outcrop complex, 3 to 15 percent slopes
38B	Poplimento-Webbtown complex, 3 t 8 percent slopes
38C	Poplimento-Webbtown complex, 8 to 15 percent slopes
38D2	Poplimento-Webbtown complex, 15 to 30 percent slopes, eroded
39B	Poplimento-Webbtown complex, rocky, 3 to 8 percent slopes
39C	Poplimento-Webbtown complex, rocky, 8 to 15 percent slopes
39D2	Poplimento-Webbtown complex, rocky, 15 to 35 percent slopes, eroded
40	Quarries-Dumps complex
41C	Rock outcrop-Catoctin complex, 3 to 45 percent slopes
42C	Rock outcrop-Dekalb complex, 3 to 45 percent slopes
43C	Rock outcrop-Opequon complex, 3 to 45 percent slopes
44B	Swimley silt loam, 3 to 8 percent slopes
45B	Swimley silt loam, rocky, 3 to 8 percent slopes
46B	Swimley-Hagerstown silt loams, 3 to 8 percent slopes
47B	Swimley-Hagerstown silt loams, rocky, 3 to 8 percent slopes
47C	Swimley-Hagerstown silt loams, rocky, 8 to 15 percent slopes
48B	Swimley-Rock outcrop complex, 3 to 8 percent slopes
49B	Thurmont loam, 3 to 8 percent slopes
50B	Thurmont gravelly loam, 3 to 8 percent slopes
51B	Timberville silt loam, 0 to 7 percent slopes
52B	Udipsamments, 0 to 8 percent slopes
53	Udorthents, loamy
54C	Udorthents, extremely stony, 0 o 45 percent slopes
55D	Udults-Udalfs association, 15 to 45 percent slopes
56	Weaver silt loam
57C2	Webbtown-Poplimento-Rock outcrop complex, 3 to 15 percent slopes, eroded
57D2	Webbtown-Poplimento-Rock outcrop complex, 15 to 30 percent slopes, eroded
58D	Weikert Berks shaly silt loams, 15 to 45 percent slopes
59B	Whiteford silt loam, 3 to 8 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oil field, cemetery, or flood pool

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail (appalachian trail only - label)

ROAD EMBLEMS & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

RAILROAD (name)

POWER TRANSMISSION LINE (normally not shown)

PIPELINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label)
- Located object (label)
- Tank (label)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well irrigation
- Wet spot (less than 2 acres)

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy Spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Chert (5 acres or less)

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 1

CLARKE COUNTY, VIRGINIA NO. 1

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

2 130 000 FEET

580 000 FEET

2 145 000 FEET

5/5 000 FEET

(Joins sheet 3)

COUNTY

JEFFERSON

FREDERICK

Wadesville

Swimley

WEST VIRGINIA

Scale 1:15 840

1 Mile

5,000 Feet

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 2

(2)

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000

2 105 000 FEET

2 125 000 FEET

570 000 FEET

500 000 FEET

495 000 FEET

560 000 FEET

2 100 000 FEET

2 110 000 FEET

(Joins inset, sheet 5)

(Joins sheet 21)

(Joins sheet 3)

(Joins sheet 5)

COUNTY

FREDERICK

WARREN

COUNTY

CREEK

FREDERICK

OPEQUON

STATE PRISON CAMP NO. 7

SEWAGE DISPOSAL

CLARKE COUNTY, VIRGINIA NO. 2

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 3

CLARKE COUNTY, VIRGINIA NO. 3

Map is compiled on 1:7[illegible] photography by the U. S. Department of [illegible]. Soil Conservation Service and cooperating agencies. Boundaries, if shown, are approximately positioned.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(Joins sheet 1)

(Joins sheet 2)

(Joins sheet 4)

(Joins sheet 6)

2 130 000 FEET

2 145 000 FEET

570 000 FEET

560 000 FEET

Stones Chapel

Cross Church

water

COUNTY

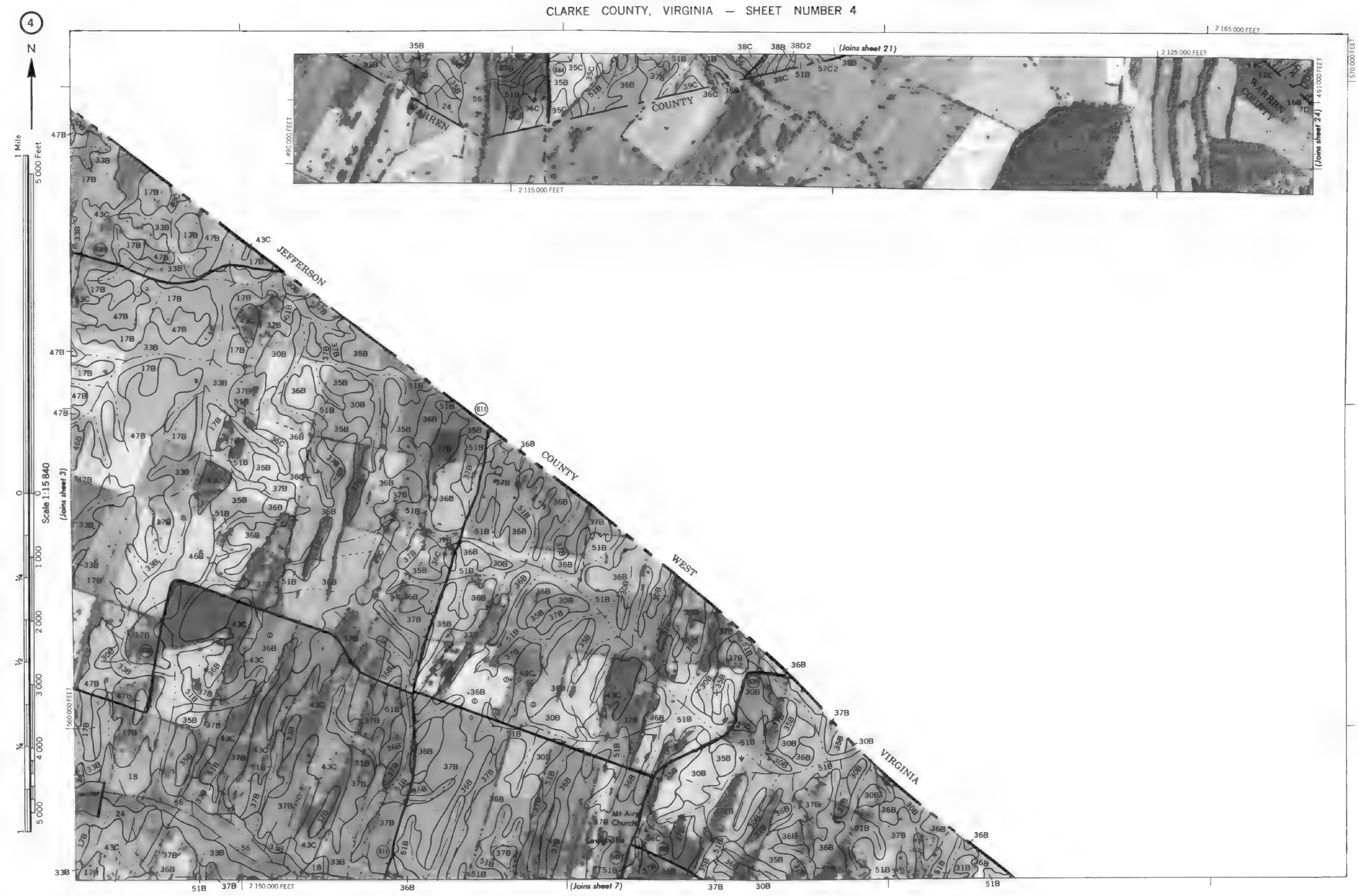
N

1 Mile

5 000 Feet

Scale 1:15 840

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 4



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately plotted

CLARKE COUNTY, VIRGINIA NO. 4

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 5

CLARKE COUNTY, VIRGINIA NO. 5

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and contains soil mapping units
Coordinate grid ticks and land division corners if shown, are approximately positioned

2 101 000 FEET

515 000 FEET

(Joins inset, sheet 13)

(Joins sheet 17)

505 000 FEET

32B 43C 33B (Joins inset, sheet 2)

2 106 000 FEET

555 000 FEET

(Joins sheet 2)

(Joins sheet 6)

545 000 FEET

58D

(Joins sheet 9)

2 125 000 FEET

5

N

1 Mile

5 000 Feet

Scale 1:15 840

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 6

6

N

1 Mile

5 000 Feet

Scale 1:15 840

(Joins sheet 5)

(Joins sheet 3)

(Joins sheet 7)

(Joins sheet 10)

2 145 000 FEET

2 130 000 FEET

545 000 FEET

555 000 FEET

Marsh Run

COUNTY FAIRGROUNDS

Cooley School

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and [illegible] agencies
Coordinate grid ticks [illegible] Land division corners, if shown, are approximately plotted.

VIRGINIA NO. 6

CLARKE COUNTY, VIRGINIA

7

CLARKE COUNTY, VIRGINIA NO. 7

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 8

8

N

1 Mile

5 000 Feet

Scale 1:15 840

0 0 1/4 1/2 3/4 1

1 000 2 000 3 000 4 000 5 000

2 185 000 FEET

550 000 FEET

537 000 FEET

532 000 FEET

545 000 FEET

2 190 000 FEET

2 186 000 FEET

2 170 000 FEET

JEFFERSON COUNTY

WEST VIRGINIA

LOUDOUN COUNTY

(Joins sheet 7)

(Joins inset, sheet 12)

(Joins sheet 12)

Long Marsh

Wickliffe

57D2

39B

39C

38B

CLARKE COUNTY, VIRGINIA NO. 8

This map was compiled on 1975 aerial photographs by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 9

CLARKE COUNTY, VIRGINIA NO. 9

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

2 110 000 FEET

(Joins sheet 5)

2 168 000 FEET (Joins sheet 20)

504 000 FEET

540 000 FEET

500 000 FEET

(Joins sheet 23)

2 171 000 FEET

LOUDOUN COUNTY

FREDERICK COUNTY

CREEK

OPEQUON

Old Salem Church

(Joins sheet 13)

2 125 000 FEET

(Joins sheet 10)

535 000 FEET

9

N

1 Mile

5 000 Feet

Scale 1:15 840

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 10

10

N

1 Mile

5 000 Feet

Scale 1:15 840

(Joins sheet 6)

(Joins sheet 9)

(Joins sheet 14)

(Joins sheet 11)

2 145 000 FEET

2 130 000 FEET

540 000 FEET

535 000 FEET

BERRYVILLE

High School

Johnson-Williams High School

Pigeon Hill

Church

Chapel

Run

Spring

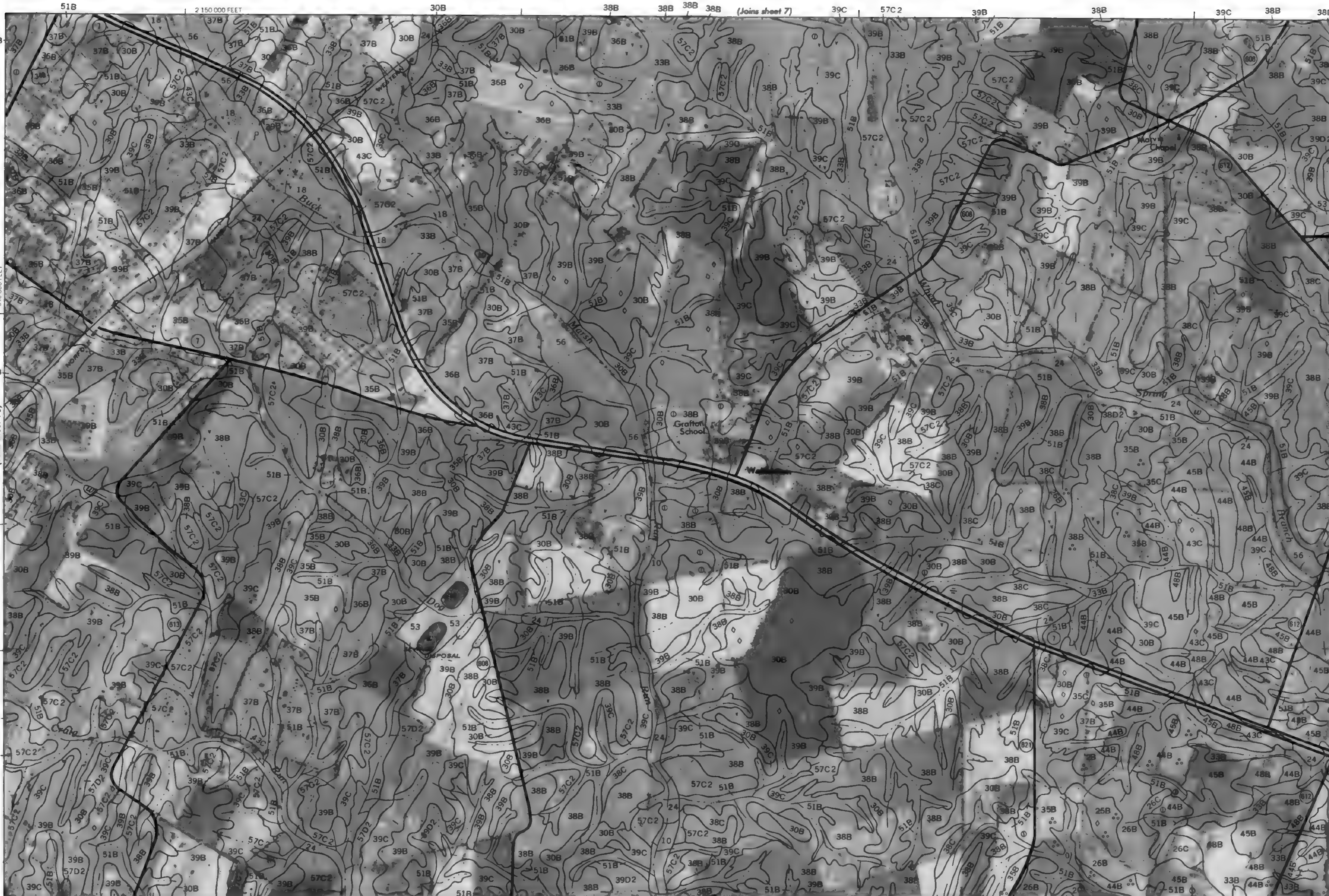
Creek

CLARKE COUNTY, VIRGINIA NO. 10

This map was compiled on 1915 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 11

(Joins sheet 7)



(Joins sheet 10)

(Joins sheet 12)

(Joins sheet 15)

2 150 000 FEET

2 165 000 FEET

540 000 FEET

535 000 FEET

11

N

1 Mile

5 000 Feet

Scale 1:15 840

CLARKE COUNTY, VIRGINIA NO. 11

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 12

12

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000

(Joins sheet 11)

(Joins sheet 8)

(Joins inset, sheet 8)

(Joins sheet 16)

2 185 000 FEET

540 000 FEET

535 000 FEET

2 170 000 FEET

JEFFERSON COUNTY, WEST VIRGINIA

Bethel Church

Holy Cross Monastery

Cobl Spring

Wheat Spring Branch

Parker Island

Raven Rocks Hollow

RIVER

SHENANDOAH

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

CLARKE COUNTY, VIRGINIA NO. 12

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 13

CLARKE COUNTY, VIRGINIA NO. 13

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 14

14

N

Scale 1:15 840

1 Mile

5 000 Feet

0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000

(Joins sheet 13)

(Joins sheet 10)

(Joins sheet 15)

(Joins sheet 18)

2 145 000 FEET

2 130 000 FEET

520 000 FEET

5 000 000 FEET

Pylecrest

Old Chapel

Little Chapel

Clayton Mills

Pigeon Hill

Chapel

Run

Church

Branch

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

CLARKE COUNTY, VIRGINIA NO. 14

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 15

CLARKE COUNTY, VIRGINIA NO. 15

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture Soil Conservation Service and ... Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 16

16

N

1 Mile

5 000 Feet

Scale 1:15 840

1 0 0 1/4 1/2 3/4 1

1 000 2 000 3 000 4 000 5 000

44B 51B 10 (Joins sheet 12) 6C 16B 7D 2 185 000 FEET

530 000 FEET (Joins inset, sheet 8)

39C 26B 2B 26B 51B (Joins sheet 15)

11B 7D 16B 2 170 000 FEET (Joins sheet 20)

520 000 FEET

SHENANDOAH RIVER

Ebenezer Church

Good Shepherd Church

Fant Run

Wiley Hollow

LOUDOUN COUNTY

This map is compiled on 1937 aerial photographs flown by U. S. Department of Agriculture, Soil Conservation Service, cooperating agencies. Boundaries of civil divisions and land division corners, if shown, are approximately positioned.

CLARKE COUNTY, VIRGINIA NO. 16

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 17

CLARKE COUNTY, VIRGINIA NO. 17

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(17)

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

2 110 000 FEET

515 000 FEET

505 000 FEET

2 125 000 FEET

(Joins sheet 13)

(Joins sheet 16)

(Joins sheet 18)

(Joins sheet 21)

Waterloo

Westbrook

Tomstock

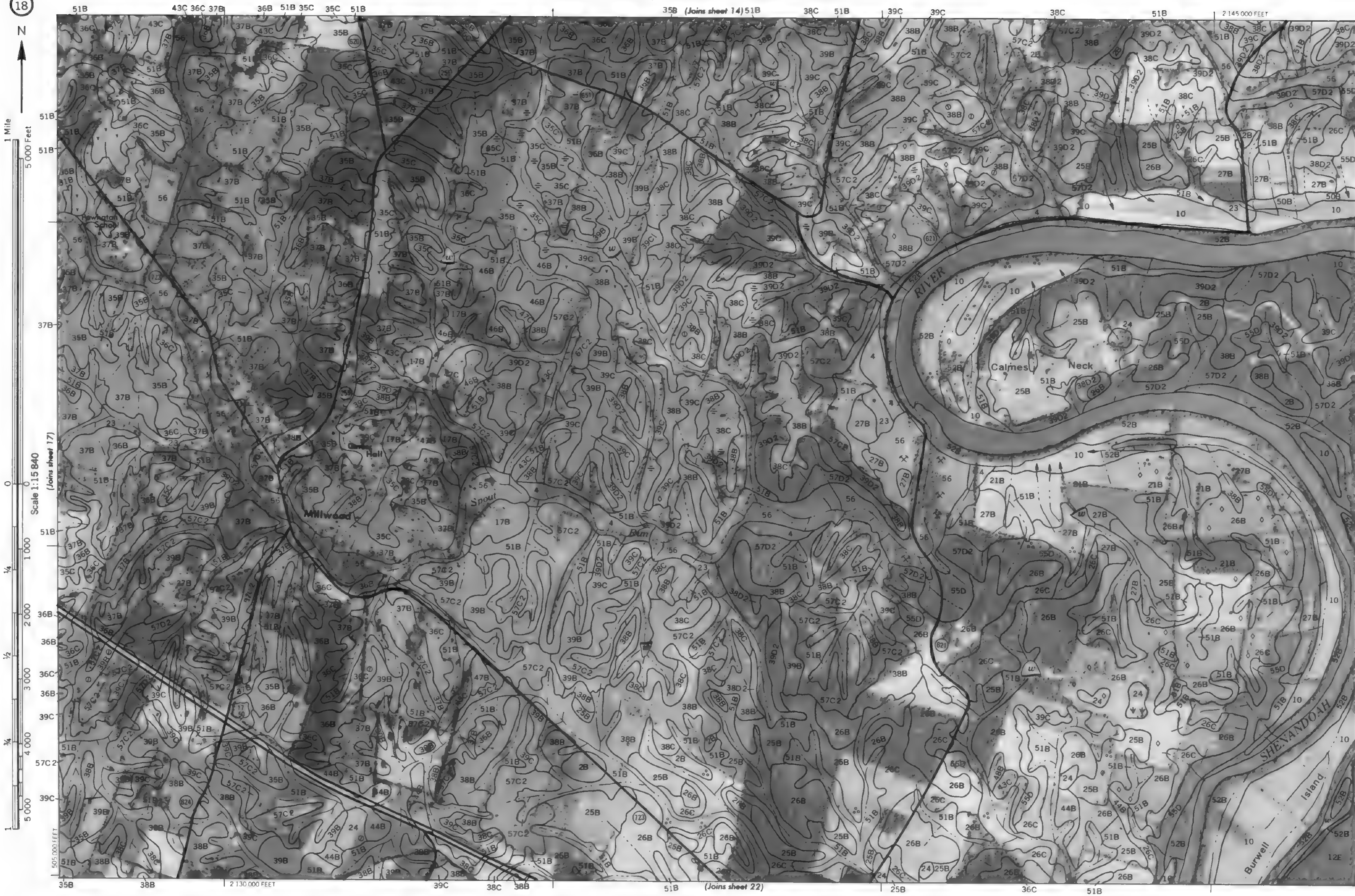
White Post

Rockville

Western

Saratoga

Run


18
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 14)
(Joins sheet 17)
(Joins sheet 19)
(Joins sheet 22)
2 145 000 FEET
515 000 FEET
2 130 000 FEET
505 000 FEET
Millwood
Spout
Run
Calmes
Neck
RIVER
SHENANDOAH
Burwell
Island

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 19

CLARKE COUNTY, VIRGINIA NO. 19

This map was compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(Joins sheet 15)

(Joins sheet 18)

(Joins sheet 20)

(Joins sheet 23)

2 150 000 FEET

515 000 FEET

505 000 FEET

2 165 000 FEET

RIVER

SHENANDOAH

Calmes Neck

Lewis Hill

Mountain Church

Mill

Willow Lake

water

Providence Chapel

Freestown

Toy Hill

Hollow

Ridge

Ashby

Bolden

Piney

Slate

19

N

1 Mile

5 000 Feet

Scale 1:15 840

0 1 000 2 000 3 000 4 000 5 000

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 20

20

N

1 Mile

5 000 Feet

Scale 1:15 840

1 0 ¼ ½ ¾ 1 5 000 4 000 3 000 2 000 1 000 0

7D 42C 20D 54C (Joins sheet 16) 2 185 000 FEET

515 000 FEET

491 000 FEET

485 000 FEET

505 000 FEET

(Joins sheet 19)

(Joins sheet 23)

(Joins sheet 24)

(Joins inset, sheet 9)

2 153 000 FEET

2 148 000 FEET

2 170 000 FEET

Buzzard Hill

Reservoir

Hollow

Berryville Reservoir

Mt Weather

RIDGE

COUNTY

BLUE

RIDGE

APPALACHIAN TRAIL

LOUDOUN

LOUDOUN COUNTY

COUNTY

FAUQUIER

801

17

50

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CLARKE COUNTY, VIRGINIA NO. 20

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 21

CLARKE COUNTY, VIRIGNIA NO. 21

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 22

22

N

(Joins sheet 18)

2 145 000 FEET

500 000 FEET

495 000 FEET

2 130 000 FEET

(Joins sheet 21)

(Joins sheet 23)

(Joins sheet 24)

1 Mile

5 000 Feet

Scale 1:15 840

SHENANDOAH RIVER

Berryville

Robinson

Cruise

Island

Ridge

Gibson

Horse Rock

White

Lovers Leap

Long Branch

Church

BYRD BRIDGE

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CLARKE COUNTY, VIRGINIA NO. 22

CLARKE COUNTY, VIRGINIA — SHEET NUMBER 23

CLARKE COUNTY, VIRGINIA NO. 23

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

2 150 000 FEET

(Joins sheet 19)

500 000 FEET

(Joins sheet 22)

(Joins inset, sheet 20)

2 165 000 FEET

495 000 FEET

Red Hollow

Beden Hollow

Duke Hollow

Hollow

Mt Carmel Church

water

RIDGE

TRAIL

COUNTY

APPALACHIAN

BLUE

LOUDOUN

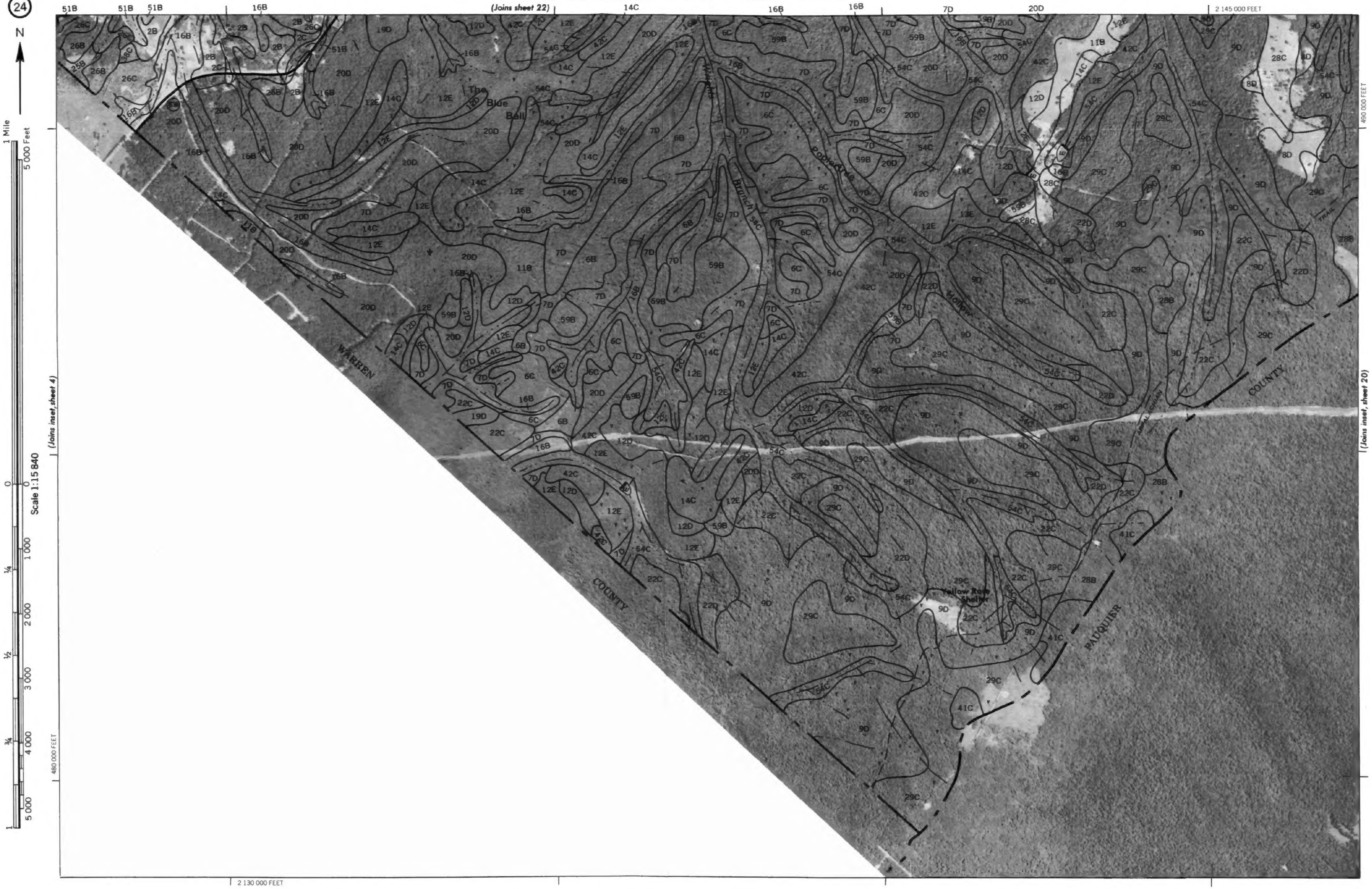
23

N

1 Mile

5 000 Feet

Scale 1:15 840



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.